ELECTRICAL REVIEW

[ILLUSTRATED.]

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Compound Direct-Acting Engine and Dynamo Combined.

The illustration, which is reproduced from our contemporary, *Industries*, of London, shows the "open" double-acting engines coupled direct to the dynamo, an arrangement which was first introduced two or three years ago by Messrs. Allen & Co., and which is now extensively used in the English navy, as well as in merchant steamers. The design of Messrs. Sautter-Lemonnier differs, however, in some particulars from English practice, and presents certain points of novelty. The cranks, instead of being placed on opposite centers—a position which insures the best possible balance between the moving parts—are in this case set at right angles. The bed plate is very light, and consists virtually of nothing more than two double T wrought-iron girders, thus necessitating a somewhat flexible connection between the engine and dynamo shafts. This is provided by the flexible coupling. It will be noticed that the two shafts are connected by means of two springs, placed within the fly-wheel, and fastened to the latter by the bolts, while the inner ends of the springs are connected with a coupling piece of peculiar shape; and thus not only is a certain lateral flexibility given, but the "knock" of the engine is not transmitted to the dynamo. It will scarcely be necessary to point out that, owing to the manner in which French dynamo makers are in the habit of mounting the armature on the spindle, the interposition of some elastic member between the engine and armature is an absolute necessity. Messrs. Breguet use for this purpose the Raffard flexible coupling. The designers of the machine under consideration employ a similar device, with the object of guarding the armature from shocks due to the blow of the steam on the pistons when the cranks pass the centers.

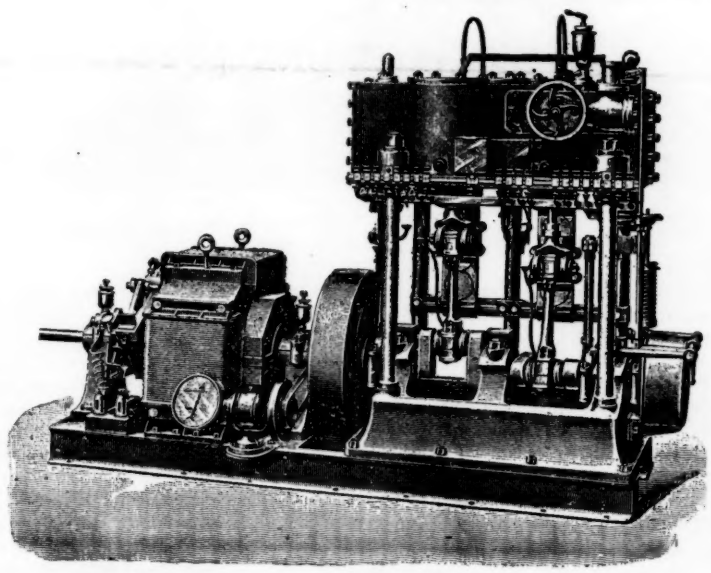
From the end elevation it will be seen that the dynamo has four poles, and consequently four circuits through the armature, equi-potential coils being coupled in parallel, so that only two brushes, set at right angles, are required for the collection of the current. The diameter of the armature is 16in., and its length is also 16in. At a speed of 350 revolutions it produces an E. M. F. of 66 volts, whilst the current may vary from 1 to 150 amperes, according to the requirements in the external circuit, the field magnets being compound wound. The over-all dimensions of the plant are: Length, 8ft. 3in.; height, 5ft. 6in.; width, 2ft. 8in. The total weight is 64cwt. In our drawings the inscribed dimensions are given in millimeters. The engine is compound, having 8in. and 12in. cylinders, with 6½in. stroke for both. The low pressure cylinder has a single slide, while the high pressure cylinder is provided with a main slide and Meyer expansion gear, adjustable by hand.

Fig. 1 shows a perspective view of this electric lighting plant, which has lately been supplied to the French iron-clad "L'Indomptable."

Lead and Zinc.

The greatest lead and zinc region in the world extends from about six miles south of Granby, in Newton county, in a northwesterly direction, across Jasper county, to the Shoal Creek lines, just beyond the State of Kansas. It has a mean width of about fifteen miles, and the ores are found all the way from the dept of 25 to 250 feet.

Joplin is almost centrally located within the above described area, and it is not, therefore, surprising that the richest deposits have been discovered within and near the city limits. There are four well-defined strata of lead ores, the first of which is found in places near the surface, and extends downward fifty feet. This stratum is commonly called float mineral. The mineral at this depth is, as a rule, found in "pockets," a single one of which has been known to yield over 3,000,000 pounds. The second stratum is found between the depths of fifty and ninety feet, and is usually in well defined "leads," with the same kind of wall, cap and stone. The third stratum is between 100 and 150 feet, is well defined, and runs from a northwesterly direction to the southeast.



COMPOUND DIRECT-ACTING ENGINE AND DYNAMO.

The fourth stratum is found between 150 and 250 feet of the surface. This has not yet been very extensively mined; but it is the best that has ever been prospected, is better defined, yields far more and better mineral, easily worked, and the supply is inexhaustible.

Zinc is not found in the first strata as lead, though, in some instances, it has been discovered near the surface. It by no means preserves the regular order of deposit that lead does, but may or may not be found in all three of the strata above described, and between the same. Sometimes, in fact frequently, it is found where there is no lead. With extensive zinc works and numerous railroads, mining has become its most lucrative branch of industry. There can be no doubt but the supply contained in the ground will last for ages yet to come.

There are several very fine smelters in Joplin, both for lead and zinc ore, so miners do not have to send their ore away for smelting. It brings cash on top of the ground.

Experiments with Light.

Further experiments of an interesting nature have been made by Italian scientists to determine the depth to which light penetrates the water of lakes and seas. The method of observing in this case consisted in placing gelatino-bromide photographic plates at different depths under the water, the plates being lowered by a sounding lead, and protected from the action of the sea water by a varnish. Experiments were made at about 1,300 to 1,400 meters off the Cape of Mont Boron, at Villefranche, in the Gulf of Nice, and in water about 550 meters deep. The result obtained by this means was most interesting. During the month of April the limit of penetration of the daylight about midday, during fine weather, was found to be about 400 meters, an observation which confirms the results of previous observations to great exactness. The unique fact also appears that there is a penetration of 300 meters all the time the sun is above the horizon, and of 350 meters during eight hours of the day.

Feed-Water Heaters in Demand.

The National Pipe Bending Company, of New Haven, Conn., have had excellent success with the National Feed-Water Heater, which is made and sold by them—over 1,000 of the heaters are now in use and in every State of the Union.

They are now making an 800 horse power heater for a new electric light station in the West, the excellent record of the 800 horse power heater in the Edison station of Detroit having influenced the sale.

They have just received an order from the Southern Cotton Oil Company for two 500 horse power heaters, and six 400 horse power heaters, with their new combined exhaust noise deadener and oil separator—these combination heaters are to be delivered by the middle of August, and are to be located in different southern cities.

This combination of heater, noise deadener and oil separator becomes valuable in electric light stations where rapid running engines are used.

The Thomson-Houston Exhibit at Lynn.

The mechanical and electrical exhibition at Lynn has closed. During the exhibition the manufacture of shoes in every stage, tacks, lemonade, and the inevitable side shows enabled a visitor to pass a pleasant evening. The power was obtained from Thomson-Houston motors, 7 horse power running elevator, 5 horse power for large fan in front of which one did not yearn in vain for a breeze, 15 horse power for main line of shafting on north side, 3 horse power to shafting on south side. The exhibit of the Thomson-Houston Company was especially interesting. There was a model dynamo (arc) little larger than a silk hat. At the Philadelphia exhibition it ran 6 small arc lamps. Near by was a 7 horse power motor driving a 50 light incandescent, and a 5 light arc machines. The last supplied current for 9 large incandescent lamps in series. The magnetic table interested crowds of visitors who never seem tired of playing with the iron rods and shavings. A half horse power motor worked a pump which operated a fountain. The smallest dynamo, used for experimental purposes, capacity 4 sixteen candle power lamps, a 45 arc machine, switches, lightning interrupters, commutators, ammeters, voltmeters, showed the completeness of the system. A circle of colored incandescent lamps revolved driven by a Speedwell motor, the lamps being lighted and extinguished by a commutator. On a center table there was placed a collection of lamps burning from 150 candle power down to one firefly power. A board filled with specimens of the process of electrical welding was a novel device. A coil of wire carrying an alternating current is placed vertically; on top there is a glass jar filled with water, in the bottom there is a coil of wire connected to the terminals of an incandescent lamp also under water. The lamp is kept at incandescence by alternating currents generated in the coil of wire attached to it. As the jar is lifted the light becomes dimmer.

Electric Light at Saratoga.

The combination of electric lighting and gas is working very successfully at Saratoga Springs. About six months ago the Saratoga Gas Company and Electric Lighting Company there, using the American system of electric lighting, were combined under one organization. The electric light plant consisted of one hundred and twenty-five arc lights and about three hundred incandescent lamps. The electric lighting has become so popular in Saratoga that the company is now increasing its arc light plant. An addition of fifty lights has just been ordered from the American Company which will be installed and in operation in about ten days. It has been suggested to the company that the lighting of the avenue from the Grand Union Hotel to the race course, as well as the race course itself, so that during the hot weather the racing could be held in the evening, would be a very great attraction. Whether this will be done this season or not is yet undecided, but it is being very carefully considered. If the trotting association should decide to use electric lights it would be one of the greatest attractions, as well as one of the greatest novelties in Saratoga.

Lightning's Freaks.

The heavy electrical storms of the past few weeks have caused an unusual number of lightning's freaks in the central West, among the most curious of which are the following:

George Baurland, Roanoke, Tex., struck in the back of the neck and both shoulder bones broken.

Residence of Geo. W. Johnson, Vincennes, Ind.; chimney demolished. Same chimney wrecked by lightning just nineteen years ago.

Nathan Crawfor and Charles Potts, Cleburne, Tex., sitting by stove in Baptist church. Lightning struck stove-pipe and killed both men.

John Standford, Skidmore, Mo., struck while riding on horse. Both killed.

Lewis Puckett, Rosedale, Mo., struck and killed while sitting in front door.

David Custer, Pickwick Place, Mo., on horse under tree. Both killed.

P. J. Salschuder, St. Louis, and J. W. Cameron, Vesper, Iowa, struck in office in Vesper, Iowa. Current entered on telephone wire, passed down over bodies of both and through slippers, leaving holes. Both recovering.

Manning Bretales and wife killed in house on Chatones Ranch, near Brownsville, Tex.; Eugeneo Rincones and wife stunned and each rendered blind in right eye; two boys, sons of Rincones, stunned.

Decatur, Ill., telephone exchange, cotton wrappings around 400 wires ignited; all wires displaced and twisted out of shape.

Lightning entered one corner of post-office in Harlem, Mo., went to floor, upstairs and out of hall bedroom.

Street car, St. Louis, struck while making trip. Conductor, driver and passenger badly stunned.

Light for the Mormons.

Salt Lake City has a local gas company, and it had a local electric light company.

The local gas company made proposals; it represented that competition would be the ruination of the gas business, and compel a drop in prices from $3 to $2 per thousand. As the Salt Lake *Tribune* says it, "In the chaste words of the Czar officials, 'It will be simply a case of dog eat dog, and you had better sell us a controlling interest.'" The electric light company came trembling down, selling 1,600 shares to the gas company; and now is fulfilled what was given out by the village poet when the show has left the town:

> The magician, he took two pigeons in his hands;
> And says he, "This is what I'll try to do:
> I'll take these 'ere birds, and I'll rub 'em into one—
> For it's less expense a-keepin' one than two."

Cleaning, Oiling and Varnishing.

Some have used for quick running machinery ⅓ sperm to ⅔ mineral oil, and have obtained better results than with either used alone. The proportions may be varied, but the mineral oil has a heavier body than sperm, and one is too light and the other too heavy.

To Clean Brass.—Rub the surface of the metal with rotten-stone and sweet oil, then rub off with a piece of cotton flannel, and polish with soft leather. A solution of oxalic acid rubbed over tarnished brass soon removes the tarnish, rendering the metal bright. The acid must be washed off with water, and the brass rubbed with whiting and soft leather. A mixture of muriatic acid and alum dissolved in water imparts a golden color to brass articles that are steeped in it for a few seconds.

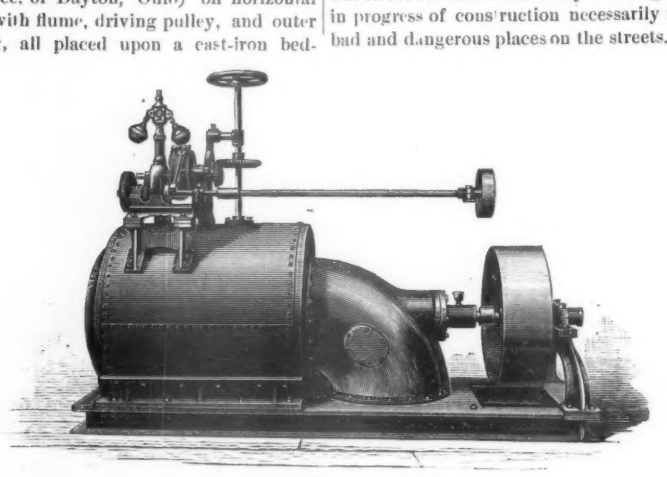
Varnish for Foundry Patterns and Machinery.—A varnish which dries as soon as it is put on, and gives the patterns a smooth surface, thus insuring an easy slip out of the mould, and which prevents them from warping, shrinking and swelling, is made as follows: 30 parts shellac, 10 parts manila copal, 10 parts Zanzibar copal are placed in a vessel which is heated externally by steam, and stirred during 4 to 6 hours, after which 150 parts of alcohol are added, and the whole heated to 87° Centigrade for 4 hours.

The Electric Light and Plants.

The Winter Palace of the Czar at St. Petersburg is on festive occasions illuminated by electric light, and the palms and exotics used in decorating the banqueting and other rooms are believed to suffer from the blaze of light. The leaves turn yellow and dry up, then fall off. The action of the light is thought to be too intense and sudden on them after their transference from the conservatories where they are wintered. The late Dr. Siemens showed that electric light promoted the growth of plants, and it is difficult to understand how even the bright light of the Imperial galleries can have the reverse effect; but so it is reported. The subject is, however, open to further investigation, as there may be other influences at work than the mere illumination. If it should prove to be the latter, the suddenness of the change from the dull greenhouses to the brilliant rooms may have to do with the problem, though it is somewhat singular that a similar effect has not been reported from other quarters.

The Victor Turbine.

The engraving herewith represents a single Victor turbine (manufactured by Stilwell & Bierce, of Dayton, Ohio) on horizontal shaft, with flume, driving pulley, and outer bearing, all placed upon a cast-iron bed-plate in the most complete and substantial manner, ready to attach the supply pipe and draft tube. In the engraving the supply pipe is designed to be attached to one end of the flume, but it can be arranged to a tach to either side of the flume if preferred, closing the end with an iron head. A governor for regulating the speed of the wheel is shown mounted on the top of the flume, and is recommended as a most complete and satisfactory arrangement.



The Victor Turbine.

This wheel is particularly adapted to the use of electric companies, on account of the remarkably steady motion, high speed and great efficiency, and is now in use by the best electric companies, and in every case is giving entire satisfaction.

Electric Lighting in Austin.

The City Water Company and the Austin Electric Light Company, of Austin, Tex., have consolidated their interests, and will hereafter be known as the Austin Water, Light and Power Company.

The new company will increase the electric light plant from its present capacity of 110 2,000 candle power Brush arc lamps, by adding an incandescent plant of 5,000 16 candle power lamps of the Westinghouse system, and the placing of four boilers connected by a continuous line of steam pipe with the boilers now used by the waterworks, making a battery of seven boilers.

Motors will be put in for the purpose of running presses, laundries, elevators, etc.

Work will be commenced immediately on the new engine and dynamo building, the dimensions being 40x100 feet. The structure will be of brick with stone trimmings.

OUR KANSAS CITY LETTER.

(From a Special Correspondent of the Electrical Review.)

A company of Kansas City capitalists has been organized to handle the electrical and other inventions which have been or may be, patented by W. F. Stocker. The capital stock of the company is $1,000,000. Among the members of the company are C. D. French, W. L. Powell, Wash Adams, C. C. Adams, B. C. Christopher, H. M. Kirkpatrick, and R. P. McGeehan. Mr. Stocker is a local electrician, and has patented several inventions, which have been successful. He has been working on the inventions which the company will control for many years, although nothing has ever been done with them, as the inventor had no money to place them on the market.

Although the capital city of Kansas is now without light, she is not destined to remain so long. If one scheme to light the city fails another will be brought forth, and ere many moons have passed Topeka will shine at night as one of the brightest capitals of these United States. At no time in the history of the city has there been greater need of well-lighted streets. There are many improvements going on which cause the streets in many places to be dangerous to those who go out during the evenings. Not only are the streets being cut up for paving purposes, but street railroads and many buildings now in progress of construction necessarily make bad and dangerous places on the streets. To see these places of danger the driver has only the light of the stars or moon, private lights and those donated by the electric company. Mayor Metsker says there will be an abundant fund of money that may be legitimately used for lighting purposes. Mr. P. G. Noel, prompted by a spirit of enterprise which is characteristic of the live citizens of Topeka, has started a subscription paper for the purpose of obtaining funds for lighting the city. It is proposed to raise from $10,000 to $12,000 in this way, and the subscribtion list already gives promise of success. Councilman Strickler said that the city would be thoroughly lighted with 500 electric lights of twenty candle power each. The Incandescent Electric Light Company propose to light the city with these 500 lights for about $12,000 per year. In case the city should be lighted this way, the lights would be kept burning from dusk to broad daylight. This would be a new feature in the history of the lighting of Topeka, as the street lamps have always been turned out at midnight. The 500 proposed electric lights would illuminate the city much better than it has ever before been lighted.

Richard Edwards, editor of *Light*, a somewhat notorious publication of Kansas-City-across-the-Kaw, has been arrested on the charge of sending obscene matter through the mails. Edwards claims that he is persecuted by a certain organization of enemies by means of what he terms "aerial electricity" or "electro-magnetism." By means of this power, he says, these enemies are enabled to read his thoughts and make him commit acts which he would not otherwise commit. This organization, he states, is composed of men who have been members of different secret societies and are now engaged in placing insurance upon people's lives without their knowledge, and influencing them by this peculiar power to commit suicide. The government was making use of this electricity, and thus all that he said or did was made known to the State Department at Washington, doing away with the aid of detectives, mail, telegraph, or telephone.

The Kansas City Electric Railway has proved a complete success. It carries thousands of passengers daily and is making its proprietors a hundred dollars a day above all running expenses. The line will be extended to the farthest limit of the most eastern suburb of the city and its number of cars will be doubled. It is understood that it will soon be consolidated with the Metropolitan Street Railway Company, the most extensive company in the city, and that this will lead to the adoption of the electric system upon all the present mule lines of the company and upon all the proposed extensions and new lines. St. Louis will soon have a duplicate of the Kansas City electric road. A number of St. Louis capitalists and street railway men have been in this city this week, examining the workings of the road here, and it is stated on good authority that they purchased the rights to use the system in St. Louis. The San Diego (Cal.) Street Railway Company, that has only been awaiting the successful operation of the road here before building one exactly like it in San Diego, have now concluded negotiations for the right to operate such a line, and work will begin on the road in California next week. Los Angeles will also have an electric road, patterned after the one here. The demand for this system of operating street railways has resulted in the organization of a strong company for the manufacture of cars, operating machinery, motors, and all the appliances for such roads. The members and details have not yet been announced, but it is understood the capital will be little less than a million dollars. The manufacturing plant will cost a half-million, employment will be given 500 or 600 people, and orders are said to have been received already sufficient to keep the works constantly occupied for a year.

The electric plant for the National Agricultural Exposition has been placed in position, and work is now proceeding night and day.

G. M.

Kansas City, Mo., July 1st.

The French Exhibition.

In its capacity as official gazette of the Exhibition of 1889, *Le Genie Civil* gives many interesting indications of the character of the future exhibits. Among other things, an historical exhibit of methods of artifical lighting is to be prepared, showing the progress of this great modern art from the rush-light and the pine-knot torch to the first-class electric lighthouse lanterns of the present day. The buildings and grounds of the Exposition itself will furnish a striking example of the present state of the science of illumination at its height. It is decided that the main exhibition building, including the whole of the Champ de Mars, shall be fully lighted every night, leaving the palace of the Trocadero to be illuminated only by lines of exterior gas jets, as a pretty object to close the perspective view across the river. So far as the buildings themselves are concerned, everything is already being pushed to the utmost. The enormous structures of the Champ de Mars, with their roofs of two hundred and fifty feet span, are to be ready for beginning the setting of the glass roofing on the first day of next July, and in a few days the seed will be sown, in a reserved portion of the Parc aux Princes, which is to furnish turf for the *pelouses* of the Champs de Mars and the Trocadero garden. Hitherto, the grass intended to beautify the grounds about the exhibition buildings has usually been either a scanty vegetation raised on the spot from seeds sown a few weeks before, or a fictitious turf, produced by Mr. Olmsted's clever device of sowing rye and keeping it closely mown; but the Paris grass of 1889 will be cultivated by itself for two years, until it has formed a close, well-rooted sod, and will then be stripped off and transferred bodily to the place intended to receive it.

Electric Eels for Lighting a Residence.

Don Miguel Santa Mezzito, a wealthy gentleman living in Achaguas, Venezuela, now at the Girard House, Phila , tells a wonderful story, alleging that he has succeeded in utilizing electricity generated by electric eels, and that his residence is lighted by electricity from the strange fish. Senor Mezzito is a well educated man, graduated from Heidelburg University and speaks several languages, including English, quite fluently.

"Yes," said he, "I have my residence lighted throughout by electricity generated by large batteries of electric eels. There is sufficient electricity wasted in the streams of the northern portion of South America to light a city as big as Philadelphia, could it be properly utilized. The town of Achaguas lies on the bank of a small river of that name, which empties into the Orinoco 100 miles to the southeast. It is in the State of Apure, about 150 miles from the eastern boundary of the United States of Columbia. The city is reached by boat up the Orinoco to San Fernando, and by rail from that place. Achaguas is an old town and has been the home of my family for many generations. I give you this in detail because I have met scientists since I came to this country who evidently disbelieve that I have electric lights running by electric eels.

"I got my first idea of utilizing the gymnotus electricus while studying electricity in Germany. Living as I had for years, near streams in which the eels abounded, and knowing personally of men and animals that had been prostrated and were killed by eels in water, I was especially interested in Faraday's account of the torpedo and other fishes. I was particularly impressed by the great scientist's statement that a full-grown electric eel contained electricity equal to 15 Leyden jars of 3,500 square inches. Upon returning to my home I at once began experimenting, and was both surprised and delighted with my success. I found that by holding a small eel, the head in one hand and the tail in the other, the shock was much stronger than in any other way, and soon discovered that the positive and negative cells are divided, the negative near the pectorals and the positive next the tail. I also satisfied myself very quickly that the electricity from the eel was the same as common electricity. It rendered the needle magnetic, decomposed chemical compounds, and by it heat was evolved and a spark was obtained. On these points, however, the scientists readily agree with me. I was satisfied that the power was there if it could be utilized, and after two years of further experimenting I succeeded in getting a battery by which a small light was run nearly an hour. Then it was merely a question of time and study. I have had the lights running, eight of them, eight-candle each, for three months. My success has brought me to this country, and I propose to explain my invention and discovery to the members of the Franklin Institute before I return to Venezuela.

"I first tried the placing of a number of the eels in one large rubber tank well insulated, but I afterward discarded it and tried the forming of a strong battery by the connection of fifty cells, with two or more eels in each. The result was more than satisfactory.

"I may state that no ground wire is used. Each cell is so connected as to complete a circuit through the wires running from either end of the row to the lamps, which are all in one circuit. The only secret is the manner in which the electricity is conducted from the cells. That I believe to be an entirely original discovery, and I shall not divulge it until it is protected by patents both in Europe and America. The eel, I learned, makes heavy, involuntary discharges of electricity when its circulation is increased, or when unnaturally excited. This I learned by seeing the Indians, under my orders, driving eels into our nets by the aid of horses and mules. With half a dozen horses rushing through the water the eels throw off such quantities of electricity that the animals are prostrated and sometimes killed. This without actually coming in contact with the fish. In an hour the eels will have discharged their store of electric fluid, and coming to the surface, lie quite still. They are entirely helpless. Taken in by the nets the eels are placed in receiving tanks, and in half an hour their electric cells are as strong and as active as ever. The Indians and ignorant people in the vicinity of Achaguas regard me as a wizard, and my life has been threatened because a minor chief of a small tribe living a few miles west of Achaguas was killed by an electric shock while taking eels for me.

"But I was telling you of the batteries. I found it necessary to keep the eels excited in order to compel them to throw off their store of electricity steadily. I tried several ways of keeping a wheel revolving in each cell, but afterward learned that the feeding of strychnine to them, or rather the placing of strychnine in the liquid in which they are kept, accelerated circulation by producing tetanic contraction of the muscles, and did all that was required.

"How about when the store of electricity is exhausted, you ask ?

"Well, that is easily overcome. I do not allow a battery to work more than half an hour at a time. By a very simple clock work contrivance I have so fixed things as to instantly, and at regular intervals, throw one battery off and another on. I keep these batteries of thirty cells each all the time ready. Relieved for an hour the eels are as active as ever. During the half hour of service the strychnia has become absorbed and the fishes quickly recover their natural power.

"Thirty cells of two eels each are equal to 1,000 volts, and strong enough to kill three men should the current pass through them. Each eel is a perfect battery within itself. There are two positive and two negative eels one-thirteenth of an inch in diameter in each cell, and each cell has many minute cells within it. I keep a large tank full of the eels on hand all the time, and am compelled to replenish the batteries every day or two. I have attempted to propagate the eels, but thus far have not been successful.

"No ; I do not see that my discovery and invention will ever benefit the world very much, because these eels are not found much outside of Northern South America, but it is interesting from a scientific standpoint, and I consider my time, labor and money well spent."

Senor Mezzito will remain in Philadelphia for a few days inspecting woolen mill machinery, and will then go to Boston.

New Patterns of Electric Bells.

The six styles of electric call bells presented on this page are indicative of the increasing requirements of electrical work. The manufacturers, Messrs. E. S. Greeley & Co., of this city, have designed these to meet the demand for varying designs and widely different tones, to avoid confusion in identifying calls where more than one bell is within hearing. These bells, by their handsome and unique appearance, commend themselves to the taste of purchasers. The gongs are made of the best cast metal, with a view to securing the greatest possible resonance. The designs are the result of a study of vibratory effects, and the dome pattern gong in particular is a fine exhibition of the possibilities in this direction. All the gongs are mounted on enameled iron box frames, the lid of the box of which is removable, offering every facility for inspecting the works without disturbing the adjacent parts or removing the frame from the wall. Every provision is made for adjustment of contact points and tension spring.

DOME PATTERN. FANCY PATTERN. OPEN PATTERN.

MIKADO PATTERN. RECTANGULAR PATTERN. SWISS PATTERN.

NEW FORMS OF ELECTRIC BELLS.

What an Arc Light Machine will do.

A ten light arc machine will run 20, 30, or even 40 lights if its speed is proportionately increased. There must be a limit somewhere, and that may be mechanical or electrical. Some say that the point of saturation of the field magnet sets the limit of the increased output of the machine. In a few types of arc dynamos regulation is obtained by weakening or strengthening the field magnets. Now for full load it is desirable to have as strong a field as possible, and therefore the iron is near saturation. But the electromotive force increases not only as the strength of the field, but nearly in proportion to the number of revolutions per minute. The field then being at full strength, we may increase the electromotive force and so the number of arc lamps we may operate by turning the armature faster until it flies to pieces. It is principally from mechanical considerations that low speeds are employed. For the higher the speed the higher the efficiency, since the same loss occurs in the field and armature, whatever the load. Suppose this loss is equal to the energy required for one lamp. Considering mechanical losses with a load of one lamp the efficiency must be somewhat less than 50 per cent., with nine lamps less than 90 per cent., with 49 lamps less than 98 per cent.

—— The carbon fraternity is just now greatly interested in the action of the electric lighting companies. A short time ago the anxiety was the other way.

The Club House of the Electric Club.

Workmen are now engaged on the club house at No. 17 East 22d, making the changes in the building demanded by the Board of Managers. A boiler house will be erected on the rear of the lot, and excavation has commenced. The work of changing and furnishing is to be rapidly pushed under the direction of the House Committee, and a special committee, composed of Messrs. H. C. Davis, J. N. Keller and M. W. Goodyear.

All the members of the club who have visited the new house express satisfaction over the location and arrangement of the building, which, with slight changes, will be an admirable headquarters for the electrical interests. The lease is for five years at $4,000 per year, $2,500 of the first year's rent having been allowed for changes and repairs.

The following notice was mailed the first of the month to the subscribers to the 4 per cent. bonds which the club decided to issue.

As the subscriptions to the bonds already exceed $15,000, the managers feel justified in making the necessary contracts for putting the new club house into proper condition to occupy, and to meet payments that will have to be made, have authorized the calling of twenty-five per cent. of the subscriptions. Please forward your check for that amount. A receipt will be given pending the completion of the payments and the preparation of the bonds. By order of the board of managers.

The next regular meeting of the club will be held at the Hotel Brighton, Coney Island, July 21st, at which time Mr. W. D. Sargent will present a paper on the latest telephone work and inventions. The success of the first of the seashore meetings, notwithstanding the extremely disagreeable weather, was very pronounced, and the July meeting now promises to be the largest ever held. The committee on entertainment expect to have a very enjoyable and edifying programme.

Western Storms.

Dakota has had a very unpleasant experience in the way of a blow. Occurring, as it did, about the time of the flag incident, it has been suggested that the hurricane was the result of a popular rise in temperature, induced by the "drop dem flag" cry, which swept over the Northwest.

At Grand Forks, at about three o'clock in the afternoon, the fury burst upon the town, tearing down the upper stories of the university building, more or less perfectly wrecking a large portion of the business part of the place. Rinks and railroad restaurants, machine shops and Scandinavian hotels, private residences and public buildings furnished cornices, tin roofs, shingles, parts of chimneys, loose boards, fence pickets and broken glass, which, with hail for make weight, pelted the good folks for the greater portion of an hour. Several people were killed, and very many more or less injured. One party, Halver Loyland, a student, was struck and killed by lightning. The total loss is estimated at $100,000. It was a hurricane, and straight goods, at that.

A twenty minute storm visited Chicago on the 20th, which came suddenly at 11.35 in the forenoon, in the form of a thunder cloud from the southwest, and completely boxed the compass during its short stay. It was dark—pitchy dark—the winds raised clouds of dust that made every man, woman and child a temporary property holder, and proceeded at once to sprinkle down the deposits, which it did to the music of heavy thunder and in the light of brilliant flashes of heaven's discharges. The rainfall for one hour was seven-tenths of an inch.

People who were out in seersuckers, and ladies who chanced to be shopping in summer duds, either stood up in street cars, or lolled over dry goods counters, or lingered at early luncheons till the clouds rolled by, or some friend came along with an umbrella. The signal service was as busy as the "devil in a gale of wind," and his remarks to a news gatherer at the time conveyed a possible suggestion that he might be that identical busybody.

Lightning dived into the lake repeatedly and a schooner off the north portion of the city was struck, and her crew stunned by the induced action of the discharge.

From Indiana came accounts of several deaths by lightning during the past week, while at one point, where a flock of sheep had gathered under a tree for shelter, sixty-two were killed.

ELECTRICAL REVIEW

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The Pittsburgh *Dispatch* said, the other day, "With electric light wires killing their man per week, it seems to be a practical question whether it is not cheaper to bury the wires than to bury the men." Is this a debatable question?

It would seem that the Board of Electrical Control (formerly Subway Commission) of this city has all the power that the Legislature can grant as regards the burying of the wires. Effective work on the part of the Board is now looked for, but there are still a number of intelligent persons connected with the electrical business who do not expect to see the overhead wires disappear any more rapidly in the future than in the past. The expenses of the Board will continue to be borne by the electric companies—a feature of the wire-burying scheme that, in the language of the famous flag philanthropist at Washington, they would like to see lapse into "innocuous desuetude."

For this season of the year unusual activity is manifested in all branches of electrical business. If one-half the enterprises proposed are actively entered upon by the fall, only those who have been early in giving orders can be promptly served.

The Julien street car, which has been making a number of successful trial trips on the Fourth avenue street railway, this city, has attracted a great deal of attention. The car is operated by the Julien storage batteries and Julien motor, and has been making regular trips each day, carrying full loads of passengers, the novelty of it causing many to take short rides.

Very important negotiations are in progress, by which, under the law passed this year by the Massachusetts Legislature, the gas companies will lease existing electric light plants, or establish those of their own. They see in the alternating systems of distributing electricity at long distances for incandescent lighting an auxiliary, not a competitor of their gas plants. For electricity may be distributed at distances to which it is not economical to lay gas mains for ordinary consumption, and at a small cost for poles and wires.

Much money and time is spent at Harvard to make class day an event of the season. Improvements have been made from year to year until all that can be done with gas candles, Chinese lanterns, etc., has been accomplished in the way of illumination. There is a strong feeling on the part of the undergraduates that the class that inaugurates the use of electricity for illuminations will achieve success. The college has under consideration the plans for a large central station, and financial considerations only stand in the way of the immediate erection of an electric light plant.

CARE AND USE OF THE INDICATOR.

In taking the instrument apart for cleaning, the pieces should be laid down in full view, on a sheet of paper, to avoid getting grit on them.

The sooner an instrument is thoroughly dried, wiped clean and bright, and then well oiled, after using, the better order it will be in, and the better work it will do. There are few cases where there is not time and opportunity to do this, or at least to wipe all parts clean and bright.

It is a good practice to keep the cocks free from grit or dirt by caps screwed on them, or by plugs of cotton waste.

The instrument should never be let get cold before wiping it dry and clean. Otherwise it will be more difficult to clean and liable to be rusted or gummed up.

The instrument may be easily picked and handled by the paper barrel and inner drum when its cylinder is too hot to touch. This is a point worth knowing, when rapid change of springs is necessary, as is particularly the case in locomotive testing.

Sponge is better than waste for cleaning the instrument, as the fibers of the latter not only get tangled up in the lever motion, which is a nuisance, but small fibers are apt to get in the pivots and interfere with their lubrication and free action.

Fine paste may be used in moderation on a soft rag, on brass and nickel plated portions of the indicator.

While agreeing with the makers of indicators as to the desirability of using only the very finest watch oil for the pivots and portions not in direct communication with the steam, we can hardly see the advantage in using such expensive material and troublesome methods of lubrication when we consider the cheap common grades of lubricators that work through from the engine cylinder. The porpoise oil, at 25 cents a thimbleful, is often quickly slushed out by stuff costing 25 cents a gallon, and dear at that. But as to the pivots and other portions that do not get thus contaminated, "plenty and often" is a good motto for the application of high grade oil. The indicator cylinder might be thoroughly oiled through by a squirt can loaded with olive or good high grade spindle oil. We have tried graphite, but have never yet succeeded with it. Perhaps some of Dixon's best "air floated" might not choke and clog the instrument, but we have never yet used it, or heard of any one who had.

Side motion in the reducing levers should be avoided. Few things produce a more unfavorable impression as to the accuracy of a test than a shaky, wobbly, clattering rig. Of course any lost motion is undesirable.

HOW MANY MORE TIMES?

There is no one characteristic of human nature more marked than its insatiable desire to be imposed upon.

This finds expression in the readiness with which shrewd men oftentimes invest their hard-earned cash in enterprises which show only the slightest ray of hope, and are only to be carried on, as was the overland commerce with the far West in the early day, over a road which was chiefly noted for the whitened skeletons along its line.

This is called the age of progress; it might well be called the age of recklessness, and in no department of business is this recklessness more signal than in the practical applications of electricity. There is a mysteriousness and intangibility about the whole science of applied electricity, which not only fascinates the attention, but benumbs and blinds the intuitive shrewdness which usually guides the average capitalist in search of a safe investment and golden returns among the rocks and quicksands of trade, and enables him to turn a deaf ear to the sirens who sit along the shore and sing, and beckon, and display their charms as they did to Jason of old in search of the Golden Fleece.

It has also been said that successes are only to be built on foundations made from previous failures; although this may be true, success can never be attained by trying over and over again in the same old ways experiments which have always proved unsuccessful heretofore.

How often we see in dynamo and motor construction, and in the minor contrivances employed in the manufacture and distribution of electric light and power, devices used which long ago were thrown aside by the pioneers of the science as good for nothing, or, at best, inadequate to the demands of this age.

But we are reminded right here, by some one, that the very gold placers which the forty miners worked over and abandoned, have since been worked by Chinamen with profit; true, but they have rendered only a Chinaman's living.

When we see capital, or the systemized endeavor to raise capital centering around some half-forgotten ghost of a former attempt at success, we feel inclined to say as Hamlet said to the ghost on his castle ramparts:

"Be thy intents wicked or charitable,
Thou com'st in such a questionable shape,
That I will speak to thee."

In the bewildering multiplicity of electric inventions, and the no less confusing array of trade statements constantly forthcoming with every issue of the scientific journals, it behooves the prospective investor to study well not only the enterprises of the day, but to look back into the past and see if the prototype of the promising invention of the hour may not be found among the wrecks which strew the shores of time.

Illustrative of this may be named that phantasm which has deluded nearly two generations of electrical investors, the primary battery electric light.

Time after time the same old plan, the same old apparatus (sometimes in a new dress, but often in its ancient garb) and the same delusive arguments have been brought forward and surrounded with ample means, and as often the result has been utter failure.

From the fact that good light can be produced in this way under the skillful manipulation of an expert, it is argued that the light can be widely distributed in our houses with comfort to ourselves and profit to the manufacturers.

To both the householder seeking a good light and the investor seeking a good investment, we would say, look well into the history of the primary battery as a source of electric light, and see if the particular one you are about to adopt is not the resuscitated ghost of some older type, and possessed of all the family infirmities.

The addition of acetic or nitric acid to gums, glues, or pastes will make an efficient adhesive for almost any purpose.

OUR CHICAGO LETTER.

(From a special correspondent of the ELECTRICAL REVIEW.)

Now that the Legislature has adjourned, and there is no possibility that that august body may pass such a telephone regulation act as the one which threatened to compel newspapers to pay from eight to ten times what they now do, the silence which that threat enforced has been broken. The newspaper hue-and-cry is now, "Tax 'em, tax 'em, good Messrs. Councilmen; if we can't get our telephones cheaper, make them pay back part of the boodle to somebody."

The question seems to have resolved itself into "What shall the harvest be?" The Council on the 27th gave the matter serious and lengthy consideration, and it was finally referred to the legal department of the city for opinions as to the legality of the tax. The members of the Council are divided on the question of how much, $25 or $10?

One of our daily papers said the other day:

"The debate of Monday night made it very plain that the telephone company will not want for advocates among the aldermen. The influences which defeated the bill regulating the charges for the instruments, at Springfield in the early part of the month, will be brought into play in Chicago later on, it is feared."

The choir will please sing without lining,

"Unhappy is the man who holds
Some Pan-Electric shares,
Which could not make the Bell turn pale,
And tremble at its scares."

A special from Indianapolis discovers a new plot in the telephone conspiracy, by which somebody is to be swindled again. The scheme is a petition asking the telephone company to return to its former method of charging by the message, and the adoption of a system by which this account will be automatically kept. The informant says all this is done in the interest of a ring who own the patent of the new instrument, and this seems corroborated by the officers of the Central Union Company, at Chicago, who deem the whole thing a sort of squeeze to force the company into using something which they do not need, and which, to say the least, is of very doubtful value for the purpose. There have been several attempts at accomplishing the result—a record of communications, but a red-headed girl with hazel eyes and a Faber No. 3 can double discount any wheel and axle movement ever yet made, as has been amply proven in the Buffalo, Milwaukee, and any number of other exchanges where the toll system is in vogue.

The Central Electric Company, 38 and 40 La Salle street, have just issued a catalogue of 8vo. size and 350 pages. It includes prices and pictures of almost everything under the sun, from ano katos and anti-hums up to a tower bell striker, and from a cast-iron telegraph outfit for children to the most perfect apparatus for testing the strength or flow of current in a thermopile or an electric light plant. In one word, from "A. to Izzard" it is quite difficult to ask for anything in their line which the McKinlock boys cannot put their fingers on for you.

After July 10th it is expected that the river and bridge business will be done by train orders, if you can call it that, when it applies to "vesseling." Professor Barrett said the other day that he had great faith in the possible effectiveness of the new scheme. Of course it is an experiment, but there is no way to know whether it's a go until you try. So the professor, when asked how far the arrangement had proceeded, said:

"I have just arranged for the location of the central office at the dock near the north entrance of the La Salle street tunnel. My idea is to locate it there in order that the man in charge may have a view of the outer harbor and be in a position to know just when the bridges should be swung. His instructions will be not to order any bridge swung for straggling vessels, but to wait until several boats are bunched and then run them through in a fleet. Under the present system it is the continual opening of the bridges for solitary vessels that creates such a nuisance. I will investigate the condition of traffic on the street and issue orders accordingly. It will not be necessary to increase

the bridge force, and about the only qualification necessary for the bridge tender will be good ears."

The Professor's action is in accordance with the orders of the Council, which at the last meeting adopted a favorable report of the Committee on Fire and Water.

There will be some Fourth of July remarks from the fresh water seals, but "the experiments will be proceeded with," as the lecturer said, "whether the frogs like them or not." It will all come out right in the sequel.

One great good, which has seldom or never been stated in connection with the bridge nuisance, if the new plan works well, will be the complete suppression of the abominable-and-useless-but-constantly-reiterated-and-al-toge'her-dammable whistling, nights, holidays and Sundays, whether your wife is sick or not. Next to a fog horn, as a baby wakener there is nothing can equal the double whistle of a little snub-nosed steam tug as it goes rattling up and down the river. It is a little worse than one of those pointer-pigeon dry goods clerks who race up and down the hard wood floor in high heeled shoes and shout cash in high soprano, accompanying their vocal efforts with the devil's tattoo on the counter, a glass cutter lead pencil playing the role of drum stick.

A celebrated American poet once wrote up the experiences of a man who vowed never to be as funny as he could again. An attempt to use the Morse characters in this column on the 25th inst. was a lamentable failure, as all old timers must have seen. The figure one is, in train dispatching, the symbol of "wait a minute," and thirteen means "understand," either interrogatively or affirmatively. The inevitable overtook the joke, 1 became 3, while thirteen was metamorphosed into 31.

N. B.—No jokes of that ilk will be perpetrated in this column in the future.

The Central Union Telephone Company have notified their stockholders of a quarterly dividend of one dollar and twenty-five cents per share, due and payable on the 20th July. This dividend, number 14, shows prosperity. The last several dividends have been but one dollar per share.

An unfortunate circumstance occurred on the 1st instant by which Mr. A. C. Holland lost his life while connecting a fan motor into a live circuit at Lansing & Sickler's restaurant kitchen. The motor was placed on a small shelf directly over the iron sink used for dish-washing. Mr. Holland was kneeling upon this, and endeavoring to make the connections, as it is claimed, with the switch open, when either from a loose contact or some other cause, he received a shock which threw him down. Instantly regaining his feet, he made the second attempt, and received a fatal shock, from which he expired within fifteen minutes.

Clare Holland, as he was generally known, years ago was one of the best among the American District Messengers of Chicago. When the first telephone exchange was opened here, the operators were selected from the messenger ranks, and Clare was one. Subsequently he became a repairer and expert adjuster. When the two companies were consolidated Clare remained with the Chicago company, as an inspector— then had charge as electrician of the electric light plant at the stock yards, when on one notable occasion, having placed himself in the direct circuit, but for the prompt action of Mr. Brennan, superintendent, he would have lost his life. Mr. B. forcibly broke the contract by pulling his hand away from the switch-board.

At the time of his death, Clare was junior member of Johnson, Holland & Co., and he it was who placed the lights and accumulator batteries in the vestibule train now running between Chicago and New York over the Pennsylvania lines.

Mr. Holland leaves a host of friends. He was universally liked, and will be regretted as one of the best of young men—honest, industrious, a student, and a gentleman. His age was 25 years.

Suit was entered on the 27th of June by Owin O'Neill, against the Municipal Electric Light Company of Chicago, for injuries received while in the company's employ. O'Neill was doing some work on live circuits, and had two fingers badly burned by cross connecting two circuits. He claims $5,000 damages.

The *Western Electrician* made its initial bow on the 2d instant. Its working force is made up as follows:

P. G. Monroe, president and treasurer; W. A. Kreidler, editor and manager; S. L. K. Monroe, secretary; J. Wayland Clark, Phillip Atkinson, Ph.D., and G. G. Minor M. E., associates in the editorial department. With these gentlemen, Messrs. Cavell, Cozens and Pemberton navigate and steer the advertising department. It is a very nicely gotten up affair, and opens up with 13 pages of advertising.

CHICAGO, July 4, 1887.

Lighting the Chicago Rivers by Electricity.

Isn't it amusing to see how humanity rushes into print on the slightest provocation? One is reminded of the lines in an author's preface:

"'Tis pleasant too, to see one's name in print;
A book 's a book, although there's nothing in 't."

When it became evident that the lighting of the rivers by electricity was to be seriously canvassed, up came Tom, and Dick, and Harry, with their opinions and suggestions, their fears and their denunciations, their prophecies and prognostications, until the *vox populi* columns of the dailies are overburdened with these wise communications. Some are very readable. One chap starts out with a statistical muck rake, and fetches up prices at which other cities are lighted per night.

Brooklyn, he says, pays 50 cents for 1,200 candle power lamps. The Joliet Company used to get $8, afterwards $5 per month. Philadelphia averages 54 cents, and Boston pays 65 cents, while Rochester pays 45 cents for one batch, and another little bunch of 77 lamps cost but 30 cents on a five year contract.

Another fellow wants to know why the city don't sail in and light up all around, because St. Paul and Minneapolis and New Orleans are lighted by electricity, and light is what is needed in Chicago; and he is not satisfied to have the city start in on a half-loaf principle. He wants the business gone into wholesale, and at once, especially on his street, which he names.

The suggestion has been made that the dynamos for a general lighting of the city could be placed in public building basements, in schools, station houses, etc. This proposition, like pretty much all that is practical in this whole matter, is from the city electrician of Chicago, Prof. Barrett.

A correspondent of one of the dailies goes into much detail, and gives the following, which are less than figures before given. He says in introducing these, and in explanation:

From the figures I give below on the lights and dynamos there is no doubt but that any electric light manufacturing company will give a discount of 10 per cent. or more where such a large quantity would be required all the city would want. In a good many instances if public buildings were used for stations for the plants it would not be necessary to go to the expense of new boilers, as the same boilers that heat the buildings where the plants are located could be used, as the lights would only be run at night, and, as in the instance of public schools, a small amount of steam would only be necessary to keep the buildings warm during the night; or the steam plants could be so altered at a very slight cost to use the exhaust steam to heat the buildings with and the live steam to run the engines. This would save considerable in fuel.

The figures I give below are for a 100-light plant complete in every detail and in complete running order. I also give the cost of running the plant ten hours each night all the year round. There is no reason why Chicago should pay the gas monopolies such a large amount yearly for public illuminating when the city can furnish the street lighting itself at such a small cost compared to what it now pays.

COST OF PLANT.

Three dynamos and 125 lamps	$11,500
Three fifty horse power engines, boilers, etc., complete	5,000
Fifty thousand feet of two-inch iron pipe, at two cents	10,000
Sixty thousand feet of lead-covered cable, at 10 cents	6,000
One hundred iron lamp-posts, at $30	3,000
Running cable, extra wire, etc	2,500
Total	$38,000

COST OF RUNNING PLANT.

Two and a half tons of coal per night, at $3 per ton	$ 750
Two hundred carbons per night, 1½ cents	300
One engineer	350
One fireman	250
Three linemen, at $250 each	750
One extra man	200
	$2,600
Repairs, etc., 10 per cent. running expenses	260
Total	$2,860

It is safe to say that $550,000 would pay for fifteen plants of 100 lights each, and that hey could be run at a cost not to exceed $175,000 per year, and at the cost of $250,000 the whole city could be lighted with electric lights.

One of the aldermen, Mr. Clark, has suggested, that in connection with the proposition to keep the bridge closed during the greater part of the daylight, there will be necessity for some method of controlling the opening and closing of these; something in the nature of a train-dispatching system. Prof. Barrett is chewing on the problem of how best to do it. The Professor says his department is rapidly enlarging, the entire river navigation having been quit-claimed to him. There is a possibility of his having his shoulders decorated with a commodore's "swabs," if he keeps on.

At the meeting of the Committee on Fire and Water on the 24th, the whole matter was quite elaborately discussed. The plan includes four bridges on the main branch of the river, six on the north and nine on the south branch, all under the control of one person, who will direct movements by telephone. The estimated cost of the introduction of the system is $4,000. The committee was unanimous in authorizing the Mayor to carry out the plan. The project for lighting the river by electricity was then referred to the law department for an ordinance.

Electric Motors for Cars.

Experiments recently made with electric motors show encouraging progress in the art of applying electric force to street railways, and it now seems probable that within a few years this force will be substituted for horse power on hundreds of miles of road. The managers and owners of street railways are manifesting great interest in the tests to which the new motors are being subjected. The rejection of horse power to make way for electricity upon the street railways of our large cities appears, remarks the *N. Y. Times*, to await now only the successful development of certain methods of applying the force and a demonstration that running expenses can be reduced by the change. The recent tests of the storage battery motors in this city seem to point to the ultimate selection of such motors for use in crowded streets. Last week an ordinary car moved by a storage battery passed repeatedly over the Fourth avenue surface road. At times the speed was twelve and even fifteen miles an hour. The car was easily controlled. The speed was governed without the slightest difficulty, and stops were made with greater precision than is attained when horses are used. It is stated that a car moved by such a motor can be used at a cost of $4.10 a day, while the cost of the same amount of service with horses is $7.50. If this be true, no objection on the score of expense can be urged.

Many will be surprised by the statement that more than 3,500,000 passengers are carried annually in this country on street cars moved by electric motors. In Montgomery, Ala., electricity is used on eleven miles of road, and the cost is reported by the General Manager to be only one-half the cost of horse power. Roads on which electricity takes the place of horses are found in Baltimore, Los Angeles, Port Huron, Detroit, Scranton, Appleton, Wis., and Denver. Electric railways are either in course of construction or under contract in twelve other cities, and in thirty-seven, companies have been formed or other steps taken for the building of such roads. Upon none of the roads now in operation in this country, however, is force supplied by storage batteries attached to the cars. In most cases power is communicated by an overhead conductor. More than 3,000,000 passengers are carried every year by electric railways in Europe. The Frankfort-Offenbach line has four miles of double track, uses fourteen motor cars, and carries 990,000 passengers. The power is communicated by overhead slotted tubes. But the roads in Brussels and Hamburg are operated by storage batteries upon the system tested last week in this city.

The system of independent motors attached to cars is clearly to be preferred, if it will do the work that is done by the more cumbrous systems, and do it at no greater cost. The storage batteries can be placed under the seats of a car. They are so arranged that the amount of force used can be quickly reduced or increased by the driver. Each car is independent of all others, and its movements do not depend upon the transmission of force from a stationary center of generation. A car using an independent and detached motor must be more serviceable under certain adverse conditions than one to which force is transmitted. Therefore the successful development of this system is greatly to be desired.

Street cars operated by independent electric motors that are easily controlled and capable of carrying passengers at the rate of 12 or 15 miles an hour are greatly to be preferred to cars moved by a cable. The whole line may be blocked on a cable road by the failure of the cable or by any accident that checks its steady movement. The cable system is not fitted for use in the narrow and crowded streets of a city like this, but cars moved by storage batteries would probably meet all the varying conditions even more successfully than cars moved by horse power. The advantages to be gained by the substitution of independent electric motors for horses in New York are many and important. The greatest of them would be the removal of thousands of horses from the streets, the abolition of the enormous stables whose accumulations poison the air, and the abatement of dangerous nuisances caused by the storage and transportation of manure that has been taken from these stables. Citizens will rejoice if the companies shall decide that the change can be made.

Organized to Bury Them.

The Board of Electrical Control, which succeeds the Electrical Subway Commission, met at the Mayor's office Monday afternoon and organized. In the absence of Mayor Hewitt, Acting Mayor Beekman took his place. Jacob Hess was made president and Theo. Moss secretary. Henry Kearney was reappointed engineer at $400 a month salary and was instructed to report at the next meeting as to the best localities for beginning new work. Messenger John W. Totten was reappointed at a salary of $75 a month.

Commissioner Gibbens said that at a previous meeting of the board permission was granted to the Western Union Telegraph Company to place wires along the line of the elevated railroads, on condition that they take down all poles along the lines. The secretary was instructed to notify the telegraph company that they must take down the old poles. The secretary was directed to notify the Metropolitan Telephone Company to remove within ninety days all the wires on Sixth avenue along the line of the conduits.

The Wires are Still Overhead in Detroit.

The telegraph, telephone and electric lighting companies in New York city have been ordered to put their wires underground, and the subway commissioners, under legislative authority, are expected to see to the matter right away. They are behind the times in New York. Our wires were ordered underground three years ago. The subway commissioners ought to come to Detroit and see how it is done.—*Detroit Tribune.*

The Philadelphia press of July 1st gives extended notice of a successful trial of the storage battery for street car work. The batteries used were those of the Electrical Accumulator Company, of New York, in connection with the Sprague motor. A company for handling these batteries for street car purposes exclusively is being formed, a number of railroad men having become interested in it.

The Chicago Edison Company has closed a contract for the wiring and furnishing the plant for the Rookery Building, on La Salle, just north of the Grand Pacific. Mr. Gorton, who obtained the contract, says it calls for 4,000 incandescent lights, and is to be the model plant of the Rowdy West.

Telephonic News

*** The truth seems to be that the people of Rochester, N. Y., are not very happy without their telephones.

*** The annual coaching parade of the James Kempster Printing Company occurred Saturday, June 25th, and was participated in by some fifty-five persons, all of whom spent a most enjoyable day at College Point, L. I Two tally-ho coaches carried the participants from the city to the seashore and back.

*** A little Buffalo girl was not feeling well, and it was thought that she might be about to have the chicken-pox. She went to bed laughing at the idea, but early the next morning went into her parents' room looking very serious, and said: "Yes, it is chicken-pox, papa; I found a fedder in the bed."

*** The M. & K. Telephone Company is building a new line of No. 9 hard-drawn copper from Topeka to Wamego, Kansas. At their Kansas City exchange they are crowded with applications for telephones, two hundred new subscribers waiting to be connected with the central office, which will be done as soon as the new switchboards can be set up.

*** The New York Railway Supply Company (Limited) is a new enterprise with headquarters at 40 and 42 Wall street, New York. It has embarked in the business of steel rails, locomotives, cars and other railway requisites. It also proposes to give special attention to electric motors. The officers of the company are: President, Neil Macdonald; secretary, Frank W. Child; and treasurer, V. A. Wilder.

*** There will probably be some interesting remarks on the telephone at the next meeting of the Electric Club, July 21st. Such well-known masters of the business as W. D. Sargent, E. T. Gilliland, H. L. Storke, E. J. Hall, jr., J. N. Keller, and others are expected to be present. So will be the subscriber, who will receive enlightenment as to why he can't talk to another subscriber when said subscriber is "busy."

*** In his recent very sensible address to workingmen in Boston, Edward Atkinson said, respecting the proposed eight-hour system: "If you cut down the work in factories, in workshops, and in the building trades to eight hours, you cut down the product. Then there will be fewer goods, fewer stores, fewer tools, fewer houses, and that means a higher price and higher rent." This is the doctrine that has been steadfastly preached in our columns for years past. The proposition to try to make men richer by reducing the hours of labor, and so reducing the amount of wealth created, is as stupid as would be a scheme for enlarging a water power by cutting down the mill dam.—*Textile Record.*

*** At the session of the Boston aldermen, June 27, the joint committee on underground wires reported on the subject of electric wires that measures to place the same underground ought to be taken if practicable. They think the city council should not make a decisive move in the matter until it shall be ascertained what is the most satisfactory method of putting wires underground now in use. To enable the committee to obtain such information as may be available, they recommend the passage of the following order: That the committee on underground wires be authorized to visit the cities of New York, Brooklyn, Philadelphia and Washington for the purpose of inspecting the underground wire systems in operation in those cities, the expense to be charged to the appropriation for incidentals. The committee consists of Maguire, Carroll and Sullivan, of the aldermen, and Keliher, Thayer, McNary, Tuttle and Gomez, of the council. The order was passed.

On the Theory of the Telephone—the Mono-Telephone or Electro-Magnetic Resonator.

In a former paper on the theory of the telephone, I think I showed that the magnetic diaphragm of this apparatus is animated by two different kinds of movements which are superposed. One kind consists of the movements of resonance, which are molecular and independent of the outward form; it is these that enable the diaphragm to transmit and reproduce all sounds, a characteristic property that ought to have been expressed in the very name of the telephone by calling it pan-telephone. The others are harmonic movements, and are transversal, corresponding to the fundamental sound and the harmonics of the diaphragm, and depending on its elasticity, form and structure; the former are prejudicial to the clear transmission of music and speech, for they alter the *timbre*, the harmonics only coinciding by the merest chance with those of the voice or instruments now in use.

In order to place beyond a doubt the existence and superposition of these two kinds of movements, I endeavored to make the one predominate over the other at will in the same diaphragm. This was effected by means of the following method, which I invented in 1881, and have merely simplified since.

I. The diaphragm of any telephone is placed in conditions favorable to its vibrating transversely freely, and in such a manner as to enable the division into nodal lines corresponding to a determined given sound to be produced. For this purpose, instead of the diaphragm being fixed at its edges, as is generally the case, it is simply placed as near as possible to the pole of the electro-magnet on a sufficient number of points of a nodal line.

If it is a rectangular diaphragm, it is placed upon two rectilinear supports coinciding with the two nodal lines of the fundamental sound. If it is a circular diaphragm, three apertures are made, from two to three millimeters in diameter at the angles of an equilateral triangle inscribed in the circumference which constitutes the nodal line of the first harmonic, and the disk is laid on three points of cork placed in a corresponding manner on a fixed straw and penetrating into the apertures.

This being done, let us introduce into the bobbin of the apparatus a series of currents of very low intensity, and gradually decreasing period; for example, proceeding from the emission of musical sounds before any transmitter whatever, either telephonic or radiophonic. Then the telephonic receiver, modified as already described, only vibrates appreciably under the action of the currents whose period is equal to that of the corresponding sound at the nodal line on which the diaphragm rests, a sound which I will term particular or special; it is no longer pan-telephonic, it is mono-telephonic, and may therefore be called a mono-telephone.

This result is not absolute. In reality, the diaphragm sounds some sub-harmonics of the special sound corresponding to the fixed nodal line; but their intensity is comparatively very low; and besides, the diaphragm reproduces somewhat lower or higher in period than the special sound, but the extreme interval between these sounds is very small, and does not generally exceed one or two commas.

These reservations are similar to those that have to be made in connection with resonators in acoustics. Likewise the kind of analysis that a mono-telephone makes of what we may term the electro-magnetic waves is analogous to that made of the sound waves by a resonator. If fact, if we communicate to them a series of successive or simultaneous waves of different periods, each of them selects in a certain degree that of the particular sound that corresponds to its geometrical form, and to the conditions in which it is placed, and greatly strengthens it. The mono-telephone might thus be termed an electro-magnetic resonator.

II. In the arrangement we have just described the transverse movements predominate, and it is easy to see the effect that they would have in an ordinary telephone; for if we try to reproduce, by means of a mono-telephone, articulate speech spoken into a transmitter, either we hear scarcely anything if the particular sound of the apparatus is not within the scale of the human voice (from the 2d to the 4th C) or else, in the contrary case, we only hear sounds modified in quality and muffled articulations, the whole being drowned, as it were, in the sonorousness of the special sound every time it occurs

But it is very easy to produce the opposite effect, viz., to make the molecular movements of resonance predominate over the transverse ones, and thus render the mono-telephone pan-telephonic, and make it reproduce all sounds with the same intensity and articulate speech with clearness.

To do this, it is sufficient to place obstacles in the way of the transverse harmonic vibrations by lightly fixing the edges or several points of the diaphragm; for example, by placing the fingers on it in a certain manner.

The most simple way of performing the experiment is as follows:

We receive into the mono-telephone various successive or simultaneous sounds, among which is the special sound or articulate speech at about the pitch of this sound. We place our ear to the diaphragm; while it is a certain distance away, or at the most just brushing it, we hear only the special sound; but as we apply the ear to the diaphragm more closely, the special sound becomes weaker and weaker, and at last we hear all sounds with equal intensity and articulate speech without any appreciable alteration of quality. By this very simple method we cause the movements of resonance to predominate over the transverse ones, and give to the apparatus the pan-telephonic property possessed by the ordinary telephone with fixed diaphragm.

In a future paper I will return to the construction of the electro-magnetic resonator and its applications.—*London Electrical Review.*

The Charleston Earthquake.

In a communication to the National Academy of Sciences, Captain Dutton gives a calculation of the depth of the Charleston earthquake center, which puts it at 12 miles below the earth's surface. A calculation by Mr. R. Mallett, of the depth at which the Neapolitan earthquake of 1857 originated, was the first attempt to solve such a problem. Working on the assumption that the earth wave radiates in straight lines from the origin, and hence at different distances from the center of surface disturbance, it has different angles of emergence, Mr. Mallett found that lines drawn parallel to these angles, if projected, would intersect each other at a mean depth of 5 miles under the surface. From seismometric and other indications the mean depth of the Yokohama earthquake of 1880 was calculated to have been about 3¼ miles.

Deflection of Sonorous Signals.

The recent wreck of the Steamship Victoria near Dieppe has given rise to a discussion of the transmission of sonorous signals in the atmosphere—a problem studied some years ago by Professor Tyndall. M. Fizeau, the well-known French physicist, has communicated a paper to the French Academy of Sciences in which he shows that there is sometimes a tendency for rays of sound proceeding from a source to curve upward, and produce what he calls a mirage of sound. This takes place when the temperature of the lower layers of the atmosphere is higher than that of the upper layers, as is frequently the case over the sea, especially during the night or in periods of fog. He suggests that special experiments should be made on this matter.

*** "At any lecture," says a telephone girl, "where the speaker can be heard only with difficulty, it will be seen that every listener will turn the ear he uses at the telephone. This would seem to prove that the telephone quickens rather than dulls the hearing."

A Surly Savant.

In the course of an article upon courtesy to representatives of the press, the *Boston Globe* gives an interesting bit of history in connection with an early electric railway.

Early in 1883 electricity was first used as a motor on a surface railway between Portrush and the Giant's Causeway, in Ireland. It was a notable event, in which the whole scientific world was deeply interested. The famous electrician, Dr. Siemens, designed the road, and its success would be the crowning glory of his illustrious life. The formal opening cermony was performed by Earl Spencer, then for the second time lord lieutenant of Ireland; and representative scientists were present from all parts of Europe and several from America. As the railway and the motor had been elaborately described already, the magnificent banquet which was to celebrate the event was the main feature of importance to the newspapers, as such a gathering would be anywhere Many of the morning papers were prepared to devote a whole page to the speeches. All the London and principal continental dailies were represented, making in all some thirty reporters and correspondents, in addition to whom several editors were present as guests. The opening ceremonies occupied less than an hour and afforded material for barely a column of descriptive matter. The trial trip was a great success, as previous experiments had assured.

Then the newspaper men wended their way to the banquet hall with the guests. Believing that seats had been reserved for them at tables, as usual, they compared notes while the other guests were being seated. When the reporters came to look for their places they found that none had been reserved. Anthony Traill, a well-known man, who had built the road, was master of ceremonies, and he was hunted up.

"Oh," he said, when informed of the trouble, "you fellows will be given some lunch in an ante-room, and I will try to arrange for one of you to get a seat when the speeches begin, and he can give the report to the rest of you."

"That will never do," was the reply. "We are not hunting a 'lunch,' and can pay for our dinners; but it is impossible for one man to represent us all, and it is absolutely necessary that we should all have seats when the speeches are being made."

"Then if the arrangement I propose doesn't suit you, you can go to the devil," returned Mr. Traill, whose success might have made him less irritable.

Without a moment's hesitation each one of the thirty reporters went to the cloak room for his hat and coat and left the place. It was still early and a delightful day, so after a bath in the moderate sea at Portrush, they paid a visit to the Causeway, delighted to be freed from the arduous duties attendant on producing five or six columns of copy. Next day not a newspaper in Great Britain or Ireland or on the continent, with one exception, even intimated that there had been a grand banquet, or that the opening so tamely described had passed off with any particular eclat. The single exception was a Belfast paper, the editor of which was a guest, who made a sort of report of the banquet. Two weeks later a modest little note, bearing the vice regal crest, went around the newspapers. In it Earl Spencer requested that, as a personal favor, an enclosed half column abstract of his really interesting speech should be printed. As he had not offended in any way, and there was no desire to punish him, the abstract was printed.

Such an act of discourtesy was undoubtedly characteristic of the man, as the same person once wrote to an electrician whom he had met while in America nearly three years ago, requesting information upon the electrical railways in the United States. A carefully prepared letter, covering some twenty-two pages, was sent in reply, and it was with no small surprise that the writer of the letter received, instead of a note of acknowledgment, the original package, which had been returned by the post office authorities, because the clerk in the office of the sender had, through some inadvertence, not affixed the proper postage, and the party in Ireland had refused to pay the fourpence due on the same.

Telegraphers Among Reporters.

It is proverbial that a lawyer should know something of everything, because he will have need of all classes of information; but this breadth of knowledge in the case of reporters is more than an aphorism, it is an every-day necessity.

A writer in the Boston *Herald*, giving some reminiscenses upon news gathering under difficulties, relates several interesting incidents to illustrate the importance which a knowledge of telegraphy can have to a reporter's work:

Reporters have on many occasions reaped great benefit from having been engaged in telegraphy before entering upon newspaper work. Among the classics of the profession is the story how William E. Sawyer secured his reports of the ceremonies attending the landing of the French cable at Duxbury. Half a dozen scribes were sent there, who passed a week in getting at all the facts of interest, using boats and buggies, interviewing savants and citizens. Sawyer, being of a

LEISURELY TURN OF MIND,

went only as far as Kingston, seven miles from Duxbury. Every noon and evening, when his brothers of the quill arrived at the telegraph office with their dispatches, he would coolly plant himself in a chair outside the window and take down all the salient points which the noisy telegraphic instruments were revealing about the cable. When he had picked the best out of the lot he would go inside, take a "key" and rattle off to his newspaper the fullest and best report, on the whole, which any Boston paper received. The boys were exasperated as they came in day after day tired with their exertions and saw him sitting there on the shady side of the piazza, but what could they do? At another time he was sent to get a Masonic celebration at Springfield, and, finding himself mixed up on the technicalities, cribbed Tom Maguire's report entire, as an operator clicked it off to Boston. Tom had no right to complain, as the trick was an old one of his own, and one which he frequently resorted to. Among the many instances where he found his art of value was an occasion when he went with S. H. Sturgis to get some information from a railroad superintendent, about a rumored purchase by his corporation. The "super" refused to say a word, and the reporters were turning away, when Maguire's quick ear noted that an operator in the office was sending a dispatch about the very thing he wanted to learn. He whispered to Sturgis, "Keep him talking," and gained time enough to get all he cared for.

Harry E. Chamberlain, one of the best known of the present Boston reporters, thinks that telegraphic knowledge is quite as valuable to men of his profession as stenography. The click-click of the electric current has more than once revealed valuable information to him. When telephones were in their experimental stage, he sat one evening at the Hyde Park telegraph office and heard the tune of "Sweet Home" distinctly, made by an attachment with what was called a singing telephone. A half column of interesting matter on what was then almost a miraculous novelty appeared the next morning. When the Roger Amero extradition proceedings were going on at Digby, N. S., Chamberlain's acquaintance with telegraphy enabled him to establish a brotherly arrangement with the single local telegraph operator, by which the reporter kept the line busy during office hours, and got 6,000 words a day to a Boston paper, while even St. John papers had to depend on the slow-moving mail trains.

OUR BOSTON LETTER.

(From a special correspondent of the ELECTRICAL REVIEW.)

The graduating exercises of the Massachusetts Institute of Technology have been held. The following abstracts of theses were read by title, the authors receiving the degree of B. S. in electrical engineering:

W. C. Fish—A commercial efficiency test of a Thomson-Houston dynamo.

J. M. Fox—The inverse electromotive force of the voltaic arc.

H. D. Sears and G. Taintor—Researches relating to the melting platinum standard of light.

R. Vose—The effect of projecting teeth in armatures.

W. G. Whitmore—A study of the efficiency of incandescent lamps.

H. J. Tucker and G. W. Patterson, jr.—Experiments on the Blake transmitter. This was read by the latter. It was found that product of the resistance and normal pressure is a constant. The pressures were varied by placing weights in a scale-pan of a balance attached to the movable electrode. As the currents to be measured were about .0004 ampere, an exceedingly sensitive electro-dynamometer was required. A unifilar instrument of the Kohlkrausch pattern was employed, the resistance of which could be varied as desired. The coils were made of No. 40 copper wire, 800 ohms in the stationary coil or field, and 180 ohms in the movable coil. The supporting wire was of platinum, $\frac{1}{250}$ inch diameter, and 18 inches long. The instrument was placed on piers, laid upon pile foundations separated at every point from the building. The lower contact of the suspended coil was by a platinum vane, in dilute sulphuric acid. The induction coil employed had 900 ohms resistance in the secondary. The dynamometer was calibrated by a Hartmanns bell magnet galvanometer, which was in turn calibrated by a standard tangent galvanometer. A note of constant pitch was maintained by an organ pipe. Two pressure regulators were attached to the blowing apparatus. It was found that secondary cells gave better results than primary batteries, and in no case were the results good if more than one cell was employed; *i. e.*, the highest electromotive force which could be advantageous was little over two volts. It was found that .00003 of an ampere could be easily measured, and the same strength of current gave a sound that could be readily heard. The current used in electric welding is a billion times as strong as this.

The West End Land Bill has been signed by the Governor and is now a law. It is probable that little will be done during the present year toward the construction of new lines and of the tunnels until the consolidation with the Cambridge, Metropolitan, and South Boston lines is consummated. Experiments have been in progress for some time to determine the possibilities of electric propulsion. In a few weeks two cars will be running on the Cambridge line.

The past two winters in the Lowell courses of free evening lectures at the Massachusetts Institute of Technology, there has been given a laboratory course in electrical measurements under the direction of Prof. Holman, assisted by Prof. Puffer. That the instruction has been appreciated is shown by the fact that large numbers of applicants for the course were disappointed. The exercises, ten in number, included tangent galvanometer, calibration of galvanoscope, Wheatstone's bridge, resistance by substitution, slide wire bridge, specific resistance, photometer, Trowbridge's cosine galvanometer, E M F. and battery resistance by various methods, calibration of Ayrton & Perry's ammeter and voltmeter. It is to be hoped that the course will be given next year and that two or more sections may be formed to accommodate all who are fitted and desire to take the course.

The Athol Gas Company, who have been manufacturing water gas, contrary to the law, petitioned the Legislature for special permission to manufacture and distribute gas for illuminating purposes, containing more than 10 per cent. carbonic oxide. The wise men on Beacon Hill thought otherwise, and the Attorney-General will prosecute the Athol Company unless it at once conforms to the law.

The General Court has adjourned. The following bills of interest to the electrical public were passed this session:

172. To authorize the Milford Electric Light and Power Company to increase its capital stock.

382. Constituting the Board of Gas Commissioners a board of gas and electric light commissioners

385. To authorize gas companies to furnish electric light.

413. To authorize the West End Railway Company to consolidate with other companies, and to establish and maintain cable and electric systems of motive power.

Underground Wires in Brooklyn and New York.

Professor Plympton, of the Electric Subway Commission, states that the New York and New Jersey Telephone Company has applied for permission to the commission to lay more underground wires. It desires to put down six and a half miles of conduit, and make necessary connections. Professor Plympton says that the jurisdiction of the commission, under the law extending its existence, will have to be decided by the courts, and that a case is being prepared. He also says that the Illuminating and Power Company, which proposes to furnish arc and incandescent lights in the neighborhood of the Novelty Theater, and the Electric Illuminating Company, would, if possible, bury their wires in several streets, and neither company has laid wires overhead, and consequently do not come under the jurisdiction of the commission. They will be able, however, to put their wires underground with the permission of the Common Council.

IN NEW YORK.

Commissioner Gibbens said to a reporter: "The ways is now clear for us to go ahead and put the wires underground. There is no disposition on the part of the Construction Company to delay matters, and I expect the 1st of August to see work going on in several places. The Construction Company is strong financially. It has telephone and telegraph companies behind it, and is abundantly able to push the work without interruption." Commissioner Moss said: "If the Construction Company does not go ahead at once, we shall give the work to another company so quickly that it will make the conduit people's hair stand. But I know there will be no delay. Things are in shape now to push the work with vigor." Commissioner Hess said: "Treasurer Dodd, of the Construction Company, told me that the company had the money, men and desire, and was ready to go right ahead. I expect to see ten miles of street torn up in a few weeks. There is one strong point about the bill. If there are any suits for damages, the Construction Company, and not the commission or city, will have to defend them. The United States Electric Light is the only company that is opposing the subway. The law gives us control of electric lines of all kinds."

..... A bright boy of 12 years, named George Knapp, who lives at No 920 Classon avenue, is employed as a messenger at No. 1,004 Fulton avenue, a branch office of the Postal Telegraph Cable Company, which is connected with the Mackay-Bennett Cable Company, and the main offices of which are at No. 191 Montague street, Brooklyn. The boy has been employed as a messenger for some time, and Mr. Howard Crounly, the assistant superintendent, in looking over the operators' books at the branch office, found that several messages which had been marked "collect" had been delivered (as he then supposed), but the collections had not been made. In every instance it was discovered that young Knapp was the boy who carried the dispatch. He was sent for and questioned about the matter. He very coolly admitted that he had not delivered the messages at all, but had either torn the dispatches in pieces or had chewed them up. When asked why he did this the reason was discovered—the destination of the telegrams was too far away from the branch office, and he didn't want to walk the distance. The offense constitutes a misdemeanor, and the boy is liable to severe punishment. Mr. Crounly said: "The whole story is that the boy was too lazy to make long trips, and would destroy the messages, but he leaves the company in a nice predicament, for any one of these people can sue us for damages." Justice Walsh committed young Knapp to jail to await examination.

— The Newark Electric Light Company, of Newark, N. J., have just increased their plant, in the face of the hot weather, with 100 Waterhouse arc lights, making 200 Waterhouse lights now installed in that city.

TELEGRAPHIC

.... Rumor now hath it that Mr. Jay Gould has purchased the B. & O. Telegraph Company's system and will personally manage and operate it. And yet a good many do not believe the rumor.

.... A dispatch from Washington says that the work of laying 17,000 feet of underground telegraph cable for the use of the District Fire Alarm and Telegraph service has just been completed, and a number of poles will be taken down. The work was done in a remarkably short time.

....A correspondent of the *Engineer* mentions that two telegraph operators, a male and a female, both otherwise healthy subjects, are being treated in Berlin for a newly-developed ailment, namely, the dropping off, one after another, of the finger nails. Prof. Mendel attributes this curious affection as the result of the constant jar caused by hammering and pushing with the finger ends in working the Morse system of telegraphy.

.... The annual meeting of the Association of Railway Telegraph Superintendents will be held at the Tremont House, Boston, July 13. This organization was started some four or five years ago by Mr. Chas. Selden, now with the B. & O. Company, but at that time with the Wabash Railway, and it at once became a strong and influential body. There will be a number of electrical devices exhibited at the July meeting.

.... An accumulator company to operate the storage battery of the Electrical Accumulator Company, of New York, has been formed at Kansas City, Mo., with Mr. Geo. M. Meyers, Superintendent of the Pacific Mutual Telegraph Company, as president, and Mr. Paul Bossart, electrician. With these capable electrical men at the head of the company it should at once meet with success in the introduction of the storage battery.

.... An experiment was made the other day in the Pennsylvania Railroad telegraph office, of charging the wires with electricity from the station of the Edison Electric Illuminating Company, which was eminently satisfactory. Sixteen candle power was used, and it furnishes sufficient electricity to operate the wires. It is understood that this method will be adopted by the company, thus doing away with the multitude of batteries now in vogue for charging the wires. It will require a new switchboard, while at the same time it will do away with a great amount of labor and be less expensive.

.... The Telegraphers' Investment Company, which has been organized at Washington, D. C., for the purpose of dealing in real estate, has elected the following board of managers and officers: Managers—M. Marean, manager Western Union Telegraph Company; Wm. H. Young, night manager Western Union; Jas. H. King, cashier Western Union; E. L. Bugbee, Geo. W. Kern, Andrew G. Johnson, Louis M. Smith, Lester S. Fisher and John A. Hutchison. Officers—Wm. H. Young, president; Jno. A. Hutchison, vice-president; Elijah I. Bugbee, secretary; Jas. H. King, treasurer; Geo. W. Kern, attorney.

.... Replying in the House of Commons recently to Sir William Harcourt, the Chancellor of the Exchequer said the telegraph service in 1880–81 showed a surplus revenue of £313,284. In 1886–87, instead of a surplus, it was anticipated that there would be a deficiency of £223,110, so that in six years there was a falling off of no less than £536,394. This was omitting the interest on the purchase money of the telegraphs, £326,418 a year. If this were taken into account there would be a deficiency for the year 1886–87 of £549,527. The falling off in net revenue was not due to diminished receipts, but to increased expenditure.

The Sims Torpedo Boat Does Wonders in the Presence of a Few People at Willett's Point.

Winfield Scott Sims is a citizen of Newark and at the same time the inventor of the Sims-Edison electric torpedo, commonly known as the fish torpedo. Since 1880 this torpedo boat has been under the favorable consideration of the government, and after numerous tests the government has given an order for ten of these boats, provided they can, for two miles, obtain a speed of ten miles an hour, and this speed the y all of them, with one exception, through accident, have achieved. This one boat (No. 9) was tested last week at Willett's Point. Messrs. T. A. Edison, Gardiner C. Sims, E. T. Gilliland and others are interested with the inventor.

Amongst those present were Gen Charles Chaille Long, Gen. Wheeler, Major W. R. King, commandant of the fort at Willett's Point; Lieut. E. P. Turner, United States Consul to Madagascar; and Capt. J. Knight, in charge of the torpedo trials. The first thing seen was a long, cigar-shaped tube made of copper, about twenty-eight feet long, and twenty-one inches in diameter in the thickest part, the center. This was the torpedo. Beginning at the pointed end, the prow, Mr. Sims explained that the tube was constructed of four different portions or apartments. The first, at the prow, was the chamber in which 450 pounds of dynamite, or explosive gellatine is placed. The second contains about two miles of cable, in this instance, or as much more as may be required, by means of which the torpedo is connected with the shore electric battery. The cable is about one inch in circumference and it is through this that the electricity is conveyed from the shore to the torpedo, and it receives its propelling power, steering power and explosive power at the will of the man in charge of the electric battery on shore or wherever the terminal station may be. The operator can at will start, stop or steer the torpedo to port or starboard and explode the charge, which can be arranged to explode by contact if desired, and he also receives notice when the hull or blade meets with any obstruction in its progress through the water.

The third chamber is occupied by all the instruments necessary for the connection with the electric battery on shore, and of interest only to the electrician, while the fourth chamber holds the propeller and steering gear. All these chambers are arranged in such a way that their weight is properly adjusted, so as to throw the center of gravity into the cable chamber; so that when the cable is paid out, and the torpedo necessarily lightened of just so much weight, the center of gravity will not be destroyed.

Above the torpedo, about four feet, and attached to it by bars of copper or steel, was a boat, covered with a deck, and about the same length as the torpedo. This, the inventor explained, was the float, and was filled with light machinery, and used to suspend the torpedo at the desired depth under the water. From the prow of the torpedo, inclined at an angle, to the bow of the boat or float, was a strong sword, which experience has shown will either cut through an obstacle, or, if too heavy and strong to be treated in that way, will enable the torpedo to dive under it, and come out unharmed on the opposite side.

Having explained all this, Mr. Sims, assuring the ladies that for this test his dynamite was gravel and could not explode, ran the cable through a tub from the aperture on the bottom of the center or cable chamber of the torpedo to the stern, attached it to the battery, and declared all was ready for the start. The little machine was slowly lowered into the water, where she lay, looking like a harmless little pleasure yacht without her mast, with the torpedo lost to sight in the water. At a given signal the electric current was turned on, and the torpedo boat seemed suddenly endowed with life. It darted out toward a troop of fishing vessels, at a great rate, and in a perfectly straight line. On went the little war engine at an eleven-mile-an-hour rate, throwing the foam from her bows, as she plowed her way. "Starboard!" rang out the clear command from Capt. Knight, in charge of the trial, and as though the boat, at the distance of a mile, had heard the word, her head came slowly but surely round to the right. "Steady," and her head again forged on. And now 5,000 feet of cable of the 10,000 in the center chamber of the torpedo had been paid out, and the order to return came. Quickly, at the word of command, her head came round, and, with her prow pointed directly at the little groop on shore, she forged ahead at undiminished speed.

When within a few hundred feet of the shore, she suddenly stopped and lay like a log; as one expressed it, she looked like some animal that had died suddenly of heart disease. And, indeed, she had; for, as Mr. Sims explained, the end of the cable had come, and the electricity had left her; and without electricity it was without life.

—— It is interesting to note that the gas-light companies throughout the country are gradually going into the electric lighting.

—— The Stockton Electric Light Company, of Stockton, Kansas, are increasing their plant, and have ordered a 12 by 12 Ball engine.

—— The Tremont Electric Light Company, Boston, are lighting the George Bird Encampment, Norwood, Mass., with thirty incandescent and two arc lights, run in multiple, on the same machine. The power is obtained from a saw-mill, 400 feet distant.

—— The Oshkosh Gas Light Company, also the Salina Gas Light Company, the former of Wisconsin, and the latter of Kansas, have both determined upon electric lighting, and have placed their order for a steam plant complete with the Ball Engine Company, of Erie, Pa.

—— A new primary battery was exhibited recently by the New Electric Light Syndicate, Limited, at 47, St. Mary Axe, London, E.C. The electrodes are zinc and iron or zinc and copper, the iron or copper electrode being covered with some depolarizing material. The exciting fluid is a caustic alkali. Originally this battery was made in the same shape as the well known Lalande cell, the iron trough itself forming one of the electrodes. This was 18 in. by 10½ in. by 3 in. On an open circuit the E.M.F. was .75 volts. When the circuit was completed through a suitable resistance the E.M.F. fell to .69 volts, and the current was 3.45 amperes. After fifty hours' continuous run the current was still the same, but after one hundred hours' continuous run it fell to 3.21 amperes, with a proportionate fall in the E.M.F., the external resistance having been kept constant all the time. After a total run of 150 hours the current was 2.27 amperes. The cells were not of the tray pattern, but ordinary cells in earthenware jars with vertical electrodes, which in this case were zinc and copper, the copper being coated with the depolarizer in the shape of an oxide of lead plate held in a bag of vegetable parchment. The solution is caustic soda. The inventor, Mr. Newton, claims that the vertical form gives better results as to constancy of current than the original pattern. Six of these cells were used to charge some E.P.S. accumulators, which in turn supplied the incandescent lamps fitted up to show that the battery is capable of being utilized for electric lighting. The crucial point in the system is the process by which the inventor hopes to recover all the zinc and about 95 per cent. of the caustic soda consumed. This process must for the present be kept secret, as the patent rights have not yet been fully secured. We are therefore unable fo state its essential particulars, or to say whether it may reasonably be expected to prove successful in practice; but it must be evident that the inventor's claim of being able to light a house at a cost comparable with that of gas can only be substantiated if his process of recovering the materials is both easy and cheap. Until this has been publicly demonstrated it would be premature to form an opinion regarding the technical and commercial value of this battery.

Hard Rubber in Demand.

The hard rubber department of the B. F. Goodrich Company, of Akron, Ohio, has increased so rapidly that they are now building a large four-story factory, 95 by 143. It will be equipped from top to bottom with the best machinery, and will be devoted exclusively to the manufacture of hard rubber goods of all kinds. They furnish everything that is required in either hard or soft rubber for electrical purposes. In addi ion to the articles listed in their new catalogue, they pay particular attention to the manufacture of specialties of all kinds, for which class of work they have unusual facilities. The Company manufactures also soft rubber tubing and rubber tape for covering wires.

—— The Faraday Carbon Company, Pittsburgh, is in the field. Its announcement on another page will interest all electric light companies.

—— The Pueblo Electric Light Company, of Pueblo, Col., are increasing their lighting capacity, and have given the contract for the steam power to the Ball Engine Company, of Erie, Pa.

—— Cord may have most of its stretch taken out of it by being heavily loaded with weights for a few days. But this will not remove the natural elasticity due to the manmaking, and to the material.

—— A notice has been issued to stockholders of the Chemical Electric Light and Power Company, Boston, appointing a meeting to see what measures the stockholders will take towards winding up the affairs of the company and dissolving the corporation.

——*Liquid Glue.*—In preference to the treatment of glue with nitric acid, the following is recommended: So-called gelatine is dissolved in the water bath in its own weight of strong vinegar, a quarter part of alcohol, and a very little alum. This glue remains liquid when cold and is much used for cementing mother of pearl, horn, etc., upon wood or metal.

—— The outlook for a large and successful electric club in Boston is excellent. The membership promises to be large. Every electrical interest is well represented in Boston, and the ablest men in the profession are enthusiastically aiding the formation of the club. Boston is a convenient center for most of New England, and the membership will include electricians in all parts of New England.

——Gray Dye.—Expose any quantity of old iron, or, what is better, the borings of gun barrels, etc., in any convenient vessel, and from time to time sprinkle them with spirits of salt (muriatic acid), diluted in four times its quantity of water, till they are thickly covered with rust; then to every six pounds add a gallon of water, in which has been dissolved two ounces of salt of tartar; lay the veneers in a dish, and cover them with this liquid. Let it boil till well soaked, say, two or three hours; then to every gallon of iquor add a quarter of a pound of green copperas (sulphate of iron), and keep the whole at a moderate temperature, till the dye has sufficiently penetrated.

—— Herr Albert Friedlander has constructed a portable electric light apparatus consisting of an ebonite cell containing the battery, whilst a small incandescent lamp of from three candle power to five candle power is mounted on the top. The electrodes of the battery are carbon and zinc, the plates being suspended from an axis above the level of the liquid, which can be turned by means of a knob on the outside of the case, and thus the plates can be more or less immersed in the exciting fluid. By this simple means internal resistance of the cell is varied, and the light is graduated. When no light is required, the knob is turned so as to raise the electrodes completely out of the liquid. The renewal of the zinc electrode when consumed can be performed by an unskilled person, and the exciting liquid is diluted sulphuric acid, into which is thrown a powder supplied in packets with the battery.

The Electric Motor Fills the Bill.

A visit to the Boston Sugar Refinery, East Boston, Mass., would convince the most indurated doubter of the success of electrical railroads. For some years the lighting has been done by an Edison plant. Tons of freight must be carted daily across a street from one storehouse to another. The distance is about 200 feet. Formerly a short car drawn by a horse was used. Sufficient freight was not carried to keep the refinery fully at work, and in crossing the street the car could not be stopped quickly enough to avoid collisions with passing teams. A Sprague motor was fitted to a car of increased length, and this joined to a second car. The motor drives one axle only, over which the weight is not placed, the regulator box and driver's seat being there. The circuit is made through an overhead wire and the rails. Three carriers on the overhead wire are used, one in each of the storehouses and one in the street, the construction of the buildings preventing the use of one only. On reaching the street one plug is pulled out of the socket on the truck and a second inserted connecting with street trolley; the street crossed a charge is again made. The load varies from 8 to 13 tons, and the road is in use constantly 10 hours a day. The train may be stopped instantly and reversed, advantages that are fully appreciated after using horse power.

—— A car filled with railroad men was propelled on the Fourth Avenue Railroad by the Julien electric motor on Thursday night. The trip was from Thirty-second street to the Grand Central Depot, and from there to the City Hall. As high speed as twelve miles an hour was obtained. Another trip was made later, with Mr. Cornelius Vanderbilt and officers of his company on board. The motor, with accompanying storage batteries, weighs a ton. The cost of running a car ninety miles by it is estimated at $4.10, against $7 50, the cost of running that distance by horses. A car propelled by the Julien storage batteries and motor was recently run on Eighth avenue.

—— The results thus far of the alliance of the gas companies with the American Electric Manufacturing Co. is described in their annual report as follows: "The past year has demonstrated the soundness of the opinion long entertained and persistently advanced by the officers of this company, that the gas and electric lighting interests of the country should co-operate instead of antagonizing each other. Gas lighting companies have finally come to recognize the fact that their interests are best subserved by the combination of the two illuminants for local lighting purposes under one management, and that it is far better for them to add electric lighting apparatus to their present plants, and thus prepare themselves to meet the entire demand for illumination in their respective localities, than to permit others to introduce the newer and more brilliant illuminent as a rival to gas. They have found that such a combination is not only practicable and profitable, but that the adoption of electric lighting by gas companies practically excludes competitors because of the superior economy with which such companies can operate electric lights in connection with their established gas business. Other electric lighting companies have at last perceived that the combination is inevitable, and are tardily endeavoring to obtain the adoption of their respective systems. But the American Company is pretty generally recognized as the pioneer in this direction, and will naturally enjoy the largest share of the patronage of the gas companies, especially in view of the superiority of its apparatus. Recognizing the great importance of the company's future dealings with this extensive and important industry, the trustees established a special gas department of the company's business, and have placed in special charge thereof one of the most experienced, successful and widely known gas engineers in the country. Colonel Stedman has resigned as treasurer, and will hereafter devote himself entirely to the duties of manager of the gas department."

A Mutual Carbon Company Proposed.

The following circular was sent out, June 23d, to the local electric light companies of the country:

At a meeting of several electric light companies, held at New York, June 22, 1887, for the purpose of reviewing the carbon question, the following resolution was adopted:

"That a committee be appointed to draw up a form of organization for the purpose of manufacturing carbons on the mutual plan, and that such committee report at a meeting to be held at New York, June 30, 1887, at ten o'clock A. M., at the office of Daniel O'Day, room 86, No. 26 Broadway, and that the secretary be directed to correspond with the various electric light companies interested, but not represented at this meeting, inviting their attendance at said meeting of June 30th."

It is felt that this is a matter of vital importance to all consumers of carbons, in view of the present condition of things, and the prospective future. The committee would therefore urge your being represented at the meeting, at which definite plans will be agreed upon, and immediately carried out.

Please address at once, on receipt of this, William S. Frear, Secretary, 6 Coal and Iron Exchange, Buffalo, N. Y., and state if you will attend.

J. F. MORRISON, Baltimore (*ex officio*).
E. W. MAHER, Albany.
A. J. DECAMP, Philadelphia.
WILLIAM S. FREAR, Buffalo.
Committee.

In response to this call the meeting of June 30th was held in New York city at the Albemarle Hotel. There were present J. F. Morrison, of Baltimore; W. S. Frear, of Buffalo; E. W. Maher, of Albany; S. J. Hart, of New Orleans; James English, of New Haven; A. J. De Camp, of Philadelphia; Messrs. Hawley, of Danbury, Ct., and Mumford, of Rochester, and Chas. Cooper, of Brooklyn, and E. T. Lynch, jr., of New York. A number of letters were read from officers of electric light companies favoring a plan by which the price of carbons could be reduced. The best means to do this was discussed at some length, the gentlemen present in many instances favoring building new carbon works; others favoring the purchase of some of the present factories. It was decided to appoint an executive committee of five to include the presiding officer, Mr. J. F. Morrison, and the secretary, Mr. W. S. Frear, whose duty it would be to formulate a plan of organization and secure the subscriptions from all the local electric light companies that cared to enter into the Mutual Company. The capital stock was placed at $150,000. It is estimated that those present represented a consumption of 10,000,000 carbons per month.

The executive committee consists of Messrs. English, De Camp, Lynch, Cooper, and Maher, with Messrs. Morrison and Frear members *ex-officio*. The committee will meet again in about one week.

—— An anecdote or two recently published in these columns, brings out another, which must take the cake, unless somebody can do very much better. This comes from an agent who gives it for a fact, that a hurried trip northward some hundreds of miles, after much telegraphing and letter-writing, resulted in finding the plant in excellent condition, but the blessed lamps wouldn't burn until the expert moved the quadrant to where the brushes could get some juice to feed 'em on. Then the agent went home again, singing veni *vidi* vici. It was another case of a new engineer.

—— The Consolidated Electric Light Company, of Portland, Me., are making preparations to operate a 600 light Westinghouse incandescent plant of the alternating type. Up to this time almost no incandescent lighting has been done except for street lighting. A population of over 40,000 is within a two mile radius of the Plum street station, and the advance orders for light indicate that a large incandescent plant will be required to furnish the supply. A Westinghouse automatic engine will drive the dynamo and exciter. The Consolidated Company expect this fall to distribute power by electric motors, the demand for which will be large on account of the immense number of small factories.

—— The Electrical Committee of Councils, of Philadelphia, has agreed to report favorably ordinances to give underground privileges to the Edison Electric Light Company and the Keystone Light and Power Company.

—— The Plainfield Electric Light Company, Plainfield, N. J., has nearly completed the enlargement of its station to a capacity of 3,000 lights on the Westinghouse alternating system. This is said to be the handsomest finished station in the country. The light is exceedingly popular, both for commercial and domestic use, and the financial results to the company are said to be very satisfactory. Mr. J. H. Tabor is the superintendent at Plainfield.

—— The Electric Improvement Company, of San Francisco, which was established a few months ago by some of the capitalists of the Pacific coast, are pushing their business with a great deal of vigor. A large amount of American apparatus was shipped last week to the Improvement Company for installation by two of the largest gas companies on the Pacific coast. The Electric Improvement Company is composed of Messrs. Sharon and his associates in California and Nevada, among whom are the principal stockholders of the San Francisco Gas Company.

—— The Waterhouse Electric and Manufacturing Company, of Hartford, Conn., have just issued a new catalogue, which treats of the Waterhouse system, and testimonials of some of the work done by the company. The claim of an 8½ ampere light on .58 horse power is well sustained. The test of the regulator on an Otto gas engine is an excellent showing in regulation, proving the Waterhouse regulator to be a fine success. But what must be the most satisfactory to the Waterhouse Company is the high testimony given by those who are operating the system.

—— The sale of the American system of electric lighting in the New England States is increasing so rapidly that the company have decided upon opening a branch office of their business in Boston. A portion of the building occupied by the Boston Electric Light Company, 197 Congress street, has been rented for offices and warerooms, which will be fitted up immediately for this purpose. The business will be under the supervision of Mr. Homer J. Goff, late general manager of the Merchants' Company in Boston, and Mr. Samuel Elder, formerly of the firm of Sowden, Elder & Wright, the former general agents of the American Company in New England, with Mr. Goff and Mr. Elder as managers, and Major L. B. Wright as mechanical engineer. Mr. Sowden has retired from the firm for the purpose of devoting his time to the management of his private interests in various local companies, using the American system, and in further extending them.

—— A corps of men from the Westinghouse Electric Light Company, of Pittsburgh, Pa., are attempting to light the Hoosac Tunnel by electricity. Manager Locke, of the old State road, tried the experiment several times, but always without success, because of the extensive volume of smoke always in the tunnel. The Fitchburg Company think they can overcome this, but experience some trouble in furnishing sufficient force to conduct the circuit. From the rear end to the center is a little over four miles of space to be covered, and power is obtained for the present from the water power of the Glen pulp mill at the last portal. Frame works upon which the electric lights hang are supported by wedges of bar iron, driven into holes drilled in the sides of the rock. Incandescent lights are used, as arc lights are impracticable, because of dripping water. It will require at least 400 lights. If the experiment is successful, the Hoosac Tunnel will be, for the first time, as bright as day, and trains will not be obliged to carry lighted lamps in the day time. A great deal of work yet remains to be done before success can be assured.

—— Phœnix, N. Y., is greatly pleased with its new electric light plant, installed by the Thomson Houston Company.

—— Messrs. Munsell & Co., 218 Water street, this city, report a very satisfactory trade in mica, which they supply in large quantities to electrical companies. They are large dealers, and find the demand in electrical circles steadily increasing.

—— A correspondent writes that at Oshkosh a swallow built its nest and reared its young just below and attached to the frame of an arc light. What a fearful example in mamma swallow, to encourage the little ones in keeping late hours, by allowing them to sleep with a bright light burning, and so break up their delicate little swallow constitutions.

—— The Jarvis Engineering Company, No. 61 Oliver street, Boston, have received the contract to install a steam plant for an Edison central station in Great Barrington, Mass. They will set a 100 horse power tubular boiler with the Jarvis patent furnace, and use the Sheffield grate bars. They will also set up a 100 horse power Armington & Sims Company engine, to be belted direct to the dynamo.

—— The Hon. J. D. Paige, Mayor of Joliet, has been studying electricity for some time, and the result of his investigation, as far as heard from, should be placed alongside Slattery's definition. Paige says electricity is of the female persuasion, it is so abominably fickle and uncertain. The REVIEW is promised any further developments which may be turned up, and Paige says there are several back counties yet to hear from.

—— The rumored carbon combination has not blanched the cheeks of the Western manufacturers or consumers. The Chicago Arc Light and Power Company, which uses about 50,000 carbons per month, had started a correspondence some time ago, looking to purchasing from European manufacturers. After all, the statement from Manager Paine, under date of the 24th, that "No conference was held with the Standard Oil Company—we have not made any offer to dispose of our entire product of petroleum coke, and, so far as we are concerned, the whole matter is without foundation," seems to lead up to a possible caving in of the whole combination.

—— Mr. J. R. Simpson, who has been the Philadelphia agent of the Mather Electric Company, of Hartford, has lately resigned his position with that company and has accepted a position with the American Electric Manufacturing Company, of New York, as a Philadelphia and Eastern Pennsylvania agent. Mr. Simpson is doing remarkably well for the American Company, having closed several very important sales within the past few weeks. About three weeks ago he established a fifty light American plant at Atlantic City which is working so successfully that the owners have decided upon doubling the capacity, the apparatus of which has been ordered and shipped from the American Company's factory.

—— The Boston Electric Light Company, under the management of President F. A. Gilbert, has become the largest local electric lighting company in the United States. The plant was composed of a consolidation of the Brush Electric Light Company of Boston, the Merchants' Electric Company of Boston using the Thomson-Houston system, and the New England Weston, the combination of the three plants making about sixteen hundred arc lights. The company have recently acquired the Citizens' Electric Light Company, of East Boston, with a capacity of about 125 lights which was built and owned by the American Electric Manufacturing Company, of New York. A large increase of apparatus has also just been made, consisting of 250 lights, all of which have been purchased from the American Electric Manufacturing Company. The addition of the Citizens' Company and the purchase of the additional plant from the American Company now makes the American system a large element in the Boston Company.

ELECTRIC LIGHT NEWS

—— There is a move in the direction of putting in water-works and an electric light plant at Cheboygan, Mich.

—— The National Pipe Bending Company, New Haven, Conn., manufacturers of the national feed-water heater, are setting a tubular boiler with the Jarvis boiler setting, and will burn screenings for fuel.

—— The Anglo-American Brush Electric Light Corporation has decided to admit one pupil free of a premium to their works. The vacancy is from time to time to be filled up by nomination of the City Guilds Institute, under the recommendation of Professor Ayrton and Professor Silvanus Thompson, and subject to some special conditions of eligibility. Mr. John Rance, jr., has been nominated accordingly.

—— In the City of Richmond, the Brush Electric Light Company have had in successful service for six months a No. 4 Brush motor, which drives a Sawyer-Man dynamo, carrying 50 sixteen candle power lamps, used in lighting Schmidt & Kaulber's electrical house, also, the same sized motor used for elevator purposes. The company supply power to four printing offices, three machine shops and several exhaust ventilators. The motor nearest station is two and one-half miles away.

—— The Committee on Exhibits of the electrical section of the American Institute consists of Dr. M. J. Roberts, Dr. Otto A. Moses, Geo. A. Hamilton, M. M. Davis, T. Wolcott, Alf. Shedlock, A. A. Knudson, C. O. Mailloux, S. S. Wheeler, W. B. Van Size, J. F. Kelly, F. B. Herzog, Wm. Hochhause, Leo Daft. The Committee on Electrical Installation consists of C. O. Mailloux, J. A. Seely, C. S. Bradley, A. A. Knudson, H. L. Waite, George A. Hamilton, J. A. Barrett, C. L. Clarke, C. L. Edgar.

—— A meeting of the State Board of Building Commissioners for the erection of the Pennsylvania State Industrial Reformatory at Huntingdon was held in Pittsburgh. The progress of the work was discussed, and it was the opinion that the reformatory should be completed and ready for use early next year—perhaps by January 1, or at least not later than April 1, 1888. They elected J. Chester Wilson electrical expert, to supervise the introduction of the electric light, etc. It is expected that 800 incandescent and a large number of arc lights will be necessary to properly illuminate the buildings, contracts for which will be let after Mr. Wilson prepares his report upon the subject and submits it to the commissioners at their next meeting, which will be held July 27.

—— Down in New Orleans, what a while ago seemed plain sailing for the electric light people and their contract with the city for lighting the first to the fourth districts inclusive, and the districts heretofore oil-lighted is now a condition of restless unhappiness.

The New Orleans Gas Light Co. filed a suit on the 3d in the Civil District Court to compel the city to annul its contract with the Louisiana Electric Light and Power Company, because the gas company says it is a large taxpayer, contributing $40,000 to $50,000 to the city revenue; that the terms of the contract will, if carried out, involve an annual expenditure of over $100,000—probably 25 per cent. of the total revenue which is applicable to matters of municipal administration; that Section 2,448 of the Revised Statutes is violated, etc., etc., including variations and repetitions.

It is barely possible that the real bed-rock reason is not given, and it is questionable if *we*, and not *they*, were to receive that little $100,000 per annum, whether that wouldn't right the great wrong. It makes a deal of difference whose bull gores the ox, don't you know?

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JUNE 28, 1887.

365,365 Signal box; Frederick W. Cole, Newton, Mass., assignor to the Gamewell Fire Alarm Telegraph Company, New York, N. Y.

365,368 Burglar alarm and call bell; Frank Cross, Louisville, Ky., assignor of one-half to Harry A. Buerk, New Albany, Ind.

365,384 Incandescent electric lamp; Philip O. Jenkins, Washington, D. C.

365,414 Hanger for electric lamps; Frederick Thomson, Montreal, Quebec, Canada.

365,438 Thermostat; Henry E. Jacobs, Milwaukee, Wis.

365,460 Electric lighting of railway cars; Charles E. Buell, Springfield, Mass.

365,493 Electric alarm clock; Max Stecher, Philadelphia, Pa., assignor of one-half to Charles Wiegmann, same place.

365,495 Incandescent electric lamp; Edward P. Thompson, Elizabeth, N. J.

365,498 Globe for electric lamps; Geo. L. Abbott, Corning, N. Y.

365,499 Incandescent electric lamp; C. Gustaf Anderson, Hartford, Ct.

365,509 Filament for incandescent electric lamps; Thomas A. Edison, Menlo Park, N. J., assignor to the Edison Electric Light Company, New York, N. Y.

365,553 Electric arc lamp; Elihu Thomson, Lynn, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut.

365,585 Electrical contact changer; Daniel Davis, jr., Boston, Mass.

365,600 Electric temperature-controlling device; Henry E. Jacobs, Milwaukee, Wis.

365,705 Printing telegraph; George B. Scott, Brooklyn, N.Y., assignor to the Western Union Telegraph Company, of New York.

365,726 Electric circuit testing apparatus; George F. Bulen, Jersey City, N. J.

BUSINESS NOTICE.

"In making the statements which follow we can verify each and all of them as facts. Mr. Edward P. Thompson, of Temple Court (7 Beekman St.), New York, is a good man to bring your patent cases to, for he is thoroughly versed in all the ins and outs of a Patent Attorney's duties. The following are some of his qualifications: Graduate of Stevens Institute as Mechanical Engineer. For four years tutor of classes of young men in mathematics and experimental physics at Elizabeth, N. J. Served professionally as Electrician and Chemist in the Swan Electric Company of New York for two years. Because of past successes as a Patent Attorney at 13 Park Row, New York, was appointed, to succeed N. S. Keith, of the patent agency of the *Electrical World* and Associate Editor. N. S. Keith is known as the Translator and Reviser of Schellen's Treatise on "Dynamo Electric Machinery." Mr. Thompson for two years personally prepared and prosecuted all the patent business of *Electrical World's* Patent Agency, and is the author of a series of articles in said paper upon "Analytical and Systematic Method of Inventing," which were widely known and favorably received. Mr. Thompson is a member of American Institute of Electrical Engineers and American Society of Mechanical Engineers. He is author of the "Expansion of Polynomials," which the ablest mathematicians of the world universally commend." —*New York Observer*.

BUSINESS NOTICE.

The business formerly conducted by E. C. Hawks, agent, will hereafter be conducted by the United Carbon Companies (office, Rooms 90 and 91 Wilshire Building, Cleveland, O.), who will endeavor to serve the electric light people to the best of their ability at all times. All communications should be addressed as above.

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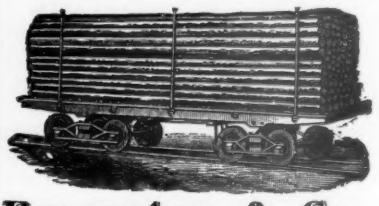

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Western Edison Light Co., H. WARD LEONARD, General Sup't.
W. J. Buckley, Mgr. Ft. Wayne Jenny El. Light Co.
Thomson-Houston Electric Light, Herbert Wadsworth, Manager Western Office.
Brush Electric Co., Alex. Kempt, Special Agent.
Excelsior Electric Co., C. J. Reilly, Western Mgr.
Sperry Electric Light Motor & Car Brake Co., 201 Royal Insurance Building.
J. H. Reid, General Manager of the Mather Electric Light Co., Chicago.
Wm. H. Purdey, Comm. of Public Works, Chicago.
John Mab, Chief Engin'r of Board of Trade, Chic.
C. J. Meimes, Gen'l Sup't Thomson-Houston Light, Omaha, Neb.
J. A. Corbey, St. Joe Electric Light and Power Co., St. Joe, Mo.
Wm. Oswald, Agt. Edison Light Co., New Orleans, La.

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The Only Genuine Leclanché Batteries

Are those which bear this LABEL and the Trade-Mark, GONDA.

DO NOT BE IMPOSED UPON BY IMITATIONS.

If dealers have not the Genuine Battery, send direct to us for Price-List.

THE LECLANCHÉ BATTERY CO.,

149 West Eighteenth Street, New York.

GONDA (FORMERLY PERMA) CELL, COMPLETE.

GENUINE DISQUE CELL, COMPLETE. The Porous Cell also bears Label.